

DOCUMENT A00801

SPECIAL PROVISIONS**BOSTON**

**Federal Aid Project No. HIP(BR)-003S(621)X
Substructure and Deck Repairs and Related Work to Br. No. B-16-053 (Steel)
Brookline Avenue over Interstate 90 and CSX/MBTA Railroad**

Labor participation goals for this Project shall be 15.3% for minorities and 6.9% for women for each job category. The goals are applicable to both Contractor's and Subcontractor's on-site construction workforce. Refer to Document 00820 for details.

SCOPE OF WORK

All work under this Contract shall be done in conformance with the *2022 Standard Specifications for Highways and Bridges*, the *Supplemental Specifications* contained in this book, the *2017 Construction Standard Details*, the *Traffic Management Plans and Detail Drawings*, *MassDOT Work Zone Safety Temporary Traffic Control*, the *1990 Standard Drawings for Signs and Supports*; the *2015 Overhead Signal Structure and Foundation Standard Drawings*, the *2009 Manual on Uniform Traffic Control Devices (MUTCD)* with Massachusetts Amendments; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; *The American Standard for Nursery Stock*; the Plans and these Special Provisions.

Please note that substructure work in Span 1, Brookline Ave over Railroad will not be included in this project.

The work to be done under this contract will include various preservation work to B-16-053 (4T3) including the following:

- Partial depth deck repairs to the deck and east sidewalk, no full depth is anticipated.
- Replacing the two pier joints with pre-compressed joint seal systems with elastomeric concrete block outs.
- Applying penetrating epoxy sealer treatment to the entire bridge deck.
- Replacing approximately 15 ft of each east approach sidewalk.
- Repairing the concrete substructure and applying elastomeric protective coating in spans 2 and 3, no work shall be done in span 1 adjacent to the railroad.

The scope of work also includes maintenance of traffic during all operations according to the Temporary Traffic Control Plans. The Contractor's operations shall potentially include temporary closings on the bridge shoulder where it is unfavorable to stage the project in any other manner. The Contractor is to survey this location and submit a staging plan for the approval of the Engineer.

SCOPE OF WORK (Continued)

Where work is directed by the Engineer and is not in the list of bid items, the work will be paid for as Time and Material (Non-Bid Items).

All work shall be performed within, and accessed by, existing State, City or Town roadway layouts. No rights to enter on, or occupy, private property have been acquired for this project.

SUBSECTION 7.05 INSURANCE REQUIREMENTS**B. Public Liability Insurance**

The insurance requirements set forth in this subsection are in addition to the requirements of the Standard Specifications and supersede all other requirements.

Paragraphs 1 and 2

The Massachusetts Department of Transportation and applicable railroads shall be named as additional insureds.

Railroad Insurance Requirements

Railroad Operations Directorate: Section F:

1. The Contractor shall furnish, with respect to the operations of the Contractor or any of the Contractor's Subcontractors performing within the Railroad right-of-way, broad form Railroad Protective Liability Insurance covering all work performed under this Contract in the amount of not less than \$5,000,000 per occurrence, \$10,000,000 aggregate combined bodily injury and property damage. The Contractor shall carry Worker's Compensation Insurance, including Employers Liability Insurance as provided by Massachusetts General Laws, Chapter 152, as amended, covering all work performed by him under the Contract. The Contractor shall carry Umbrella Liability Coverage with limits of not less than \$10,000,000 per occurrence, covering all work performed by him under this Contract. Automobile Liability Insurance: The Contractor shall provide Automobile Liability Insurance to include the use of all vehicles; owned, leased, hired and non-owned, with limits not less than \$1,000,000 combined single limit covering all work performed under the Contract.
2. Such insurance shall be written on an occurrence basis.

SUBSECTION 7.05 INSURANCE REQUIREMENTS (Continued)

3. The MBTA and applicable railroads shall be the named insureds on such insurance. Additional named insured are listed below. Original policies and certificates shall be made out to the MBTA and applicable railroads and mailed to:

Keolis: General Counsel
 Keolis Commuter Services, LLC
 470 Atlantic Avenue
 Boston, MA 02210

CSX: General Manager
 CSX
 1 Bell Crossing Road
 RD. #2, Box 145
 Selkirk, NY 12158-9618
 Tel. (518) 767-6111

AMTRAK: General Superintendent
 230 Congress Street
 Boston, MA 02110
 Tel. (617) 654-2020

4. The Contractor shall furnish to the MBTA and railroad companies a signed original of the Railroad Protective Liability Policy prior to entry upon the railroad right-of-way.

5. Such policies shall provide 30 days notice to each named insured by the insurance company before any change or cancellation of the policies.

6. Such Railroad Protective Insurance policies may be provided in forms commonly referred to as AAR/AASHTO or ISO/RIMA but not Oregon.

Questions regarding insurance should be directed to the MBTA's Risk Manager at 617-222-3064.

The contractor shall be aware of the latest MBTA insurance limits / requirements. See the following link for more information:

<https://www.mbtarealty.com/licenses.html>

CONTRACTOR QUESTIONS AND ADDENDUM ACKNOWLEDGEMENTS

Prospective bidders are required to submit all questions to the Construction Contracts Engineer by 3:00 P.M. on the Tuesday of the previous week before the scheduled bid opening date. Any questions received after this time will not be considered for review by the Department.

Contractors should email questions and addendum acknowledgements to the following email address massdotSpecifications@dot.state.ma.us The MassDOT project file number and municipality is to be placed in the subject line.

WORK SCHEDULE

Work by the Contractor that includes any lane closures shall be restricted to occur between the hours of 9:00 p.m. and 5:00 a.m. Sunday through Friday which includes the establishment and breakdown of temporary traffic management control.

These hours are not guaranteed and are all subject to change at the time of construction by District 6 Operations. Actual Contractor work durations will depend on the specific work area locations and associated time required to implement and remove temporary traffic management controls. No daytime work allowed on the expressway within D6 and on local roads within city of Boston.

The Contractor shall coordinate with MassDOT District 6 to attend the MassDOT District 6 Traffic Coordination meetings to give notice to the MassDOT District 6 Maintenance Resident Engineer in advance of beginning any work affecting the maintenance of traffic and shall not proceed with work operations without specific notice to, and the approval of, MassDOT.

All Contractor access to the work areas shall be coordinated with an approved by MassDOT District 6. MassDOT District 6 will have the authority to grant and deny the Contractor access to the work areas, MassDOT shall have final authority on access to the work areas and may deny previous access approvals with no additional compensation to the Contractor.

Specific events occurring in Boston and neighboring communities will impact the work schedule. The Contractor shall coordinate with MassDOT to accommodate for these events.

WORK SCHEDULE (Continued)**Traffic Accommodation***(Supplementing Subsection 7.17)*

Traffic control devices shall comply with the relevant provisions of Subsection 850. and the following:

The order of precedence for the document that governs the positioning, sizing, color(s), shape, design, and operation of temporary traffic control devices shall be as set forth below:

1. Details for a specific location that have been designed by the Contractor and approved by the Engineer.
2. Details included in this contract.
3. MassDOT's *Work Zone Safety Temporary Traffic Control (Document A00815 on this Contract), Typical Details and Massachusetts Guidelines for MassDOT, Municipalities, Utilities, and Contractors.*
4. MassDOT's *Standard Details and Drawings for the Development of Temporary Traffic Control Plans* (<https://www.mass.gov/files/documents/2017/10/24/tcp.pdf>).
5. *Massachusetts Amendments to the MUTCD*
([Massachusetts Amendments to the Manual on Uniform Traffic Control Devices - Revised Massachusetts Amendments to 2009 Edition](#))
6. *Manual on Uniform Traffic Control Devices for Streets and Highways*
(<https://mutcd.fhwa.dot.gov/>).

During construction, the Contractor shall contact the Engineer for the most recent copy of the *Work Zone Safety Temporary Traffic Control, Typical Details and Massachusetts Guidelines for MassDOT, Municipalities, Utilities, and Contractors.*

Truck Mounted Attenuators (TMAs), when shown in any details, are mandatory. Truck Mounted Attenuators shall shadow Temporary Traffic Control service vehicles during setup and breakdown of all temporary traffic control setups on roadways with speeds greater than 45 mph.

Traffic police, when required, shall be located at a sufficient distance in advance of the work area, so that they can warn oncoming motorists of the work.

MassDOT reserves the right to provide certified Roadway Flaggers, who are MassDOT employees, at the discretion of the Engineer. The Contractor shall not be charged nor compensated for the use of MassDOT employee flaggers.

MassDOT reserves the right to provide or modify the Traffic Controls for Construction and Maintenance Operations for this project during the construction phase at the discretion of the Engineer

SECTION 6.00: CONTROL OF MATERIALS**Subsection 6.01: Source of Supply and Quality**

Replace this subsection with the following:

The Engineer may approve material at the source of supply before delivery to the project.

The Department reserves the right to require approval of the source of supply for any material to be incorporated into the work prior to delivery or manufacture.

The Engineer reserves the right to prohibit the use of materials, products, or components which, in their opinion, may be supplied in a manner not reasonably consistent with contract requirements.

The determination of the Engineer shall be final upon all questions which pertain to supplier approval.

Fabricators of structural steel, miscellaneous steel and aluminum products, and producers of precast concrete and prestressed concrete must be on the Department's approved fabricators list on the date the bids are opened. Only approved fabricators will be allowed to perform work for the Department.

The Contractor shall furnish all materials required for the work specified in the Contract. Said materials shall meet the requirements of the specifications for the kind of work involving their use. For any materials named or described in these specifications, an approved equivalent to that named or described in the said specifications, may be furnished.

Chapter 7, Section 22, Clause 17, of the General Laws, as amended, shall apply to the purchase by the Contractor of supplies and materials to be used in the execution of this Contract.

The rules referred to require a preference in the purchase of supplies and materials, other considerations being equal, in favor first, of supplies and materials manufactured and sold within the Commonwealth, and second, of supplies and materials manufactured and sold within the United States.

All iron and steel products, manufactured products, and construction materials shall comply with all Federal Buy America and Federal Build America Buy America (BABA) requirements, where applicable.

In Contracts requiring structural steel, precast, or prestress concrete, the Contractor shall furnish approved shop drawings, and fabrication procedures to the Department's inspector at the supply source or fabrication site. Materials for permanent construction shall be new, shall conform to the requirements of these specifications, and shall be approved by the Engineer.

SECTION 6.00 (Continued)

Materials for temporary structures or supports adjacent to traveled ways, the failure of which would compromise the safety of the public or the traveled ways, need not be new but the Contractor shall be required to submit certification by a Structural Professional Engineer that the material meets the requirements for the intended use and shall be approved by the Engineer. Any fabrication shall conform to the requirements of these specifications. These requirements shall not apply to gantry systems and supports as well as other mechanized systems.

If testing finds that an approved supplier does not furnish a uniform product, or if the product from such source proves unacceptable at any time, the Contractor shall, at their own expense, take any and all steps necessary to furnish approved materials.

The Contractor shall submit to the Department for approval a notarized Certificate of Compliance (COC) from the Manufacturer or Supplier for each kind of manufactured or fabricated material furnished.

The COC shall certify compliance with the specifications and shall contain the following information:

1. Contract Number, City or Town, Name of Road and Federal Aid Number;
2. Name of the Contractor to which the material is supplied;
3. Kind of material supplied;
4. Quantity of material represented by the certificate;
5. Means of definitively identifying the consignment, such as invoice number, lot number, bill of lading number, label, marking, etc.;
6. Date and method of shipment;
7. Statement indicating that the material has been tested and found in conformity with the pertinent parts of the Contract;
8. Statement indicating that the material meets the requirements of Buy America and BABA, where applicable;
9. Results of all required tests including the chemical analysis in the case of metal: or in lieu of furnishing the results a statement that results of all required tests pertinent to the certificate and not submitted shall be maintained available by the undersigned for a period of not less than three years from date of final acceptance or not less than three years from date of final payment (whichever period is the longest shall apply).
10. Signature of a person having legal authority to bind the supplier.

These COCs shall be delivered to the contract site at the same time that the materials are delivered and before such materials are incorporated into the work. The Contractor shall attach to the COC a document listing the contract bid item number(s), sub item(s), or lump sum breakdown item number(s), as applicable, under which the material will be compensated. Payment for the item in which the materials are incorporated may be withheld until these COCs are received in a form that meets the contract requirements.

SECTION 6.00 (Continued)

If the Contractor has new materials purchased for use on a previous Department Contract which have never been used and which comply with the specifications, these materials may be furnished and used. The Contractor shall submit their own sworn statement certifying that such materials were purchased for use on a previous Contract (naming and identifying such Contract) and shall attach the original COC.

Any cost involved in furnishing the certificate shall be borne by the Contractor.

Subsection 6.03: Delivery and Storage of Materials

Replace this Subsection with the following:

Materials and equipment shall be progressively delivered to or removed from the site so that there will be neither delay in the progress of the work nor an accumulation of materials that are not to be used or removed within a reasonable time. All materials shall be stored in pre-approved locations per the conditions of the property owner.

Delivered materials and materials originating from the site, shall be stored to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located to facilitate their prompt inspection.

Approved portions of the State Highway Layout (SHLO) may be used for storage of project materials and for the placing of the Contractor's plant and equipment upon obtaining a state highway access permit. All storage sites shall be restored to their original condition by the Contractor. No additional compensation shall be given for the design, construction, preparation, or restoration of the storage site(s) or obtaining the access permit which may include but is not limited to a Traffic Management Plan (TMP), utilities, and lighting.

The application for a permit shall contain a locus map identifying the proposed location, a description of the specific activities and uses of the staging area, a TMP in accordance with section 7.10 depicting minimum setbacks from the roadway and any existing structures for stored materials and equipment and how equipment will safely access and exit the staging area.

Any additional space required must be provided by the Contractor at their expense. Municipal, private, or other state-owned property shall not be used for storage purposes without written permission of the owner or lessee, and copies of such written permission shall be furnished to the Engineer.

SECTION 7.00: LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

Subsection 7.03: Permits and Licenses

(page I.47) Replace Subsection 7.03 in its entirety with the following:

The Contractor shall procure all required permits and licenses, pay all charges, fees and taxes and shall give all notices necessary and incidental to the due and lawful prosecution of the work. The cost thereof shall be included in the prices bid for the various items listed in the Proposal. Copies of all required permits and licenses shall be filed with the Engineer prior to the beginning of work.

For overweight vehicles in excess of 130,000 lbs., the Contractor shall provide a copy of each overweight vehicle permit to the Engineer prior to arrival or delivery of the vehicle to a project site. This requirement is for all Contractors, their subcontractors, equipment suppliers and material suppliers.

The Contractor's attention is directed to the provisions of General Laws, Chapter 90, Section 9 as amended, in which it is provided that earth-moving motor vehicles which exceed certain dimensions or weight limits as specified in said Act, and which are used exclusively for building, repair and maintenance of highways, may be operated without registration for a distance not exceeding 300 yd on any way adjacent to any highway or toll road being constructed, relocated or improved provided a permit, authorizing such use, to be issued by the Commissioner of Public Works or by the Board or officer having charge of such way, has been procured by the Contractor.

COVID 19 GUIDELINES AND PROCEDURES

Per Subsection 5.09 – Inspection of the Work - the Contractor is required to provide assistance to the Engineer to make a complete and detailed inspection of the work. That assistance includes furnishing equipment to perform the inspection, therefore the Contractor will be required to provide CDC compliant Personal Protective Equipment (PPE) to Department personnel field staff. The CDC compliant PPE shall consist of face masks, gloves and eye protection.

All costs associated with compliance with this provision are considered to be incidental to the contract cost and therefore the Contractor will not be entitled to any additional compensation.

NORTHERN LONG-EARED BAT PROTECTION

The U.S. Fish and Wildlife Service has listed the northern long-eared bat as threatened under the Endangered Species Act (ESA) and the following requirements exist to protect the bat and its habitat. This project has been reviewed by MassDOT Highway Division's Environmental Services Section and has been determined to have "No Effect" to the northern long-eared bat (See Document USFWS No Effect). No time of year restrictions are required for the project at this time. If additional cutting is proposed by the Contractor that is outside the scope of this contract, additional review is required by the MassDOT Highway Division's Environmental Services Section, and time of year restrictions may apply to such tree cutting.

ENVIRONMENTAL PERMITTING

Environmental permits have not been obtained, as no work (either temporary or permanent) is proposed to occur in water or wetland resource areas. If Contractor erection, demolition, storage, or other procedures require work to occur in or otherwise impact water or wetland resource areas, the Contractor is advised that no associated work can occur until all required environmental permits have been obtained. The Contractor must notify the District 6 Highway Director and Resident Engineer in writing at least 60 days prior to desired commencement of the proposed activity. All environmental submittals, including any contact with Local, State, or Federal environmental agencies, must be coordinated through the District 6 Environmental Engineer. The Contractor is expected to fully cooperate with requests for information and provide same in a timely manner. The Contractor is further advised that the Department will not entertain a delay claim due to the time required to obtain the environmental permits. As a supplement to Section 7.00 of the Standard Specifications, the Contractor is reminded that no debris of any type shall be allowed to enter water or wetland resource areas, either temporarily or permanently.

HOLIDAY WORK RESTRICTIONS

(Supplementing Subsection 7.09)

The District Highway Director (DHD) may authorize work to continue during these specified time periods if it is determined by the District that the work will not negatively impact the traveling public. DHD may allow work in those areas on a case by case basis and where work is behind barrier and will not impact traffic

Below are the holiday work restrictions:

New Years Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day. No work on local roadways on the holiday without permission by the DHD and the local police chief.

Martin Luther King's Birthday (Federal Holiday)

No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

President's Day (Federal Holiday)

No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

Evacuation Day (Suffolk County State Holiday)

No work restrictions due to traffic concerns.

Patriot's Day (State Holiday)

Work restrictions will be in place for Districts 3 and 6 along the entire Boston Marathon route and any other locations that the DHD in those districts determine are warranted so as to not to impact the marathon. All other districts work restrictions will be as per DHD.

HOLIDAY WORK RESTRICTIONS (Continued)**Mother's Day**

No work on Western Turnpike and Metropolitan Highway System from 5:00 AM on the Friday before, until the normal start of business on the following day.

Memorial Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the Friday before, until the normal start of business on the following day.

Bunker Hill Day (Suffolk County State Holiday)

No work restrictions due to traffic concerns.

Juneteenth

No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

Independence Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day. No work on local roadways on the holiday without permission by the DHD and the local police chief.

Labor Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the Friday before, until the normal start of business on the following day.

Columbus Day (Federal Holiday)

No work on major arterials from 5:00 AM on the Friday before, until the normal start of business on the following day

Veterans' Day (Federal Holiday)

No work restrictions due to traffic concerns.

Thanksgiving Day (Federal Holiday)

No work on major arterials from 5:00 AM two days before until the normal start of business on the following Monday.

Christmas Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day.

SUBSECTION 8.02 SCHEDULE OF OPERATIONS

Replace this subsection with the following:

An integrated cost and schedule controls program shall be implemented by the Contractor to track and document the progress of the Work from Notice to Proceed (NTP) through the Contractor Field Completion (CFC) Milestone. The Contractor's schedules will be used by the Engineer to monitor project progress, plan the level-of-effort required by the Department's work force and consultants and as a critical decision-making tool. Accordingly, the Contractor shall ensure that it complies fully with the requirements specified herein and that its schedules are both accurate and updated as required by the specification throughout the life of the project. Detailed requirements are provided in Division II, Section 722 Construction Scheduling.

SUBSECTION 8.14 UTILITY COORDINATION, DOCUMENTATION, AND MONITORING RESPONSIBILITIES

A. GENERAL

In accordance with the provisions of Section 8.00 Prosecution and Progress, utility coordination is a critical aspect to this Contract. This section defines the responsibility of the Contractor and MassDOT, with regard to the initial utility relocation plan and changes that occur as the prosecution of the Work progresses. The Engineer, with assistance from the Contractor shall coordinate with Utility companies that are impacted by the Contractor's operations. To support this effort, the Contractor shall provide routine and accurate schedule updates, provide notification of delays, and provide documentation of the steps taken to resolve any conflicts for the temporary and/or permanent relocations of the impacted utilities. The Contractor shall provide copies to the Engineer of the Contractor communication with the Utility companies, including but not limited to:

- Providing advanced notice, for all utility-related meetings initiated by the Contractor.
- Providing meeting minutes for all utility-related meetings that the Contractor attends.
- Providing all test pit records.
- Request for Early Utility work requirements of this section (see below).
- Notification letters for any proposed changes to Utility start dates and/or sequencing.
- Written notification to the Engineer of all apparent utility delays within seven (7) Calendar Days after a recognized delay to actual work in the field – either caused by a Utility or the Contractor.
- Any communication, initiated by the Contractor, associated with additional Right-of-Way needs in support of utility work.
- Submission of completed Utility Completion Forms.

B. PROJECT UTILITY COORDINATION (PUC) FORM

The utility schedule and sequence information provided in the Project Utility Coordination Form (if applicable) is the best available information at the time of the bid and has been considered in setting the contract duration. The Contractor shall use all of this information in developing the bid price and the Baseline Schedule Submission, inclusive of the individual utility durations sequencing requirements, and any work that has been noted as potentially concurrent utility installations.

C. INITIATION OF UTILITY WORK

The Engineer will issue all initial notice-to-proceed dates to each Utility company based on either the:

- 1) Contractor's accepted Baseline Schedule
- 2) An approved Early Utility Request in the form of an Early Utility sub-net schedule (in accordance with the requirements of this Subsection)
- 3) An approved Proposal Schedule

C.1 - BASELINE SCHEDULE – UTILITY BASIS

The Contractor shall provide a Baseline Schedule submission in accordance with the requirements of Subsection 8.02 and inclusive of all of the information provided in the PUC Form that has been issued in the Contract documents. This is to include the utility durations, sequencing of work, allowable concurrent work, and all applicable considerations that have been depicted on the PUC Form.

SUBSECTION 8.14 (Continued)**C.2 – EARLY UTILITY REQUEST – (aka SUBNET SCHEDULE) PRIOR TO THE BASELINE**

All early utility work is defined as any anticipated/required utility relocations that need to occur prior to the Baseline Schedule acceptance. In all cases of proposed early utility relocation, the Contractor shall present all known information at the pre-construction conference in the form of a ‘sub-net’ schedule showing when each early utility activity needs to be issued a notice-to-proceed. The Contractor shall provide advance notification of this intent to request early utility work in writing at or prior to the Pre-Construction meeting. Prior to officially requesting approval for early utility work, the Contractor shall also coordinate with MassDOT and all utility companies (private, state or municipal) which may be impacted by the Contract. If this request is acceptable to the Utilities and to MassDOT, the Engineer will issue a notice-to-proceed to the affected Utilities, based on these accepted dates.

C.3 – PROPOSAL SCHEDULE - CHANGES TO THE PUC FORM

If the Contractor intends to submit a schedule (in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02) that contains durations or sequencing that vary from those provided in the Project Utility Coordination (PUC) Form, the Contractor must submit this as an intended change, in the form of a Proposal Schedule and in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02. These proposed changes are subject to the approval of the Engineer and the impacted utilities, in the form of this Proposal Schedule and a proposed revision to the PUC form. The Contractor shall not proceed with any changes of this type without written authorization from the Engineer, that references the approved Proposal Schedule and PUC form changes. The submission of the Baseline Schedule should not include any of these types of proposed utility changes and should not delay the submission of the Baseline Schedule. As a prerequisite to the Proposal Schedule submission, and in advance of the utility notification(s) period, the Contractor shall coordinate the proposed utility changes with the Engineer and the utility companies, to develop a mutually agreed upon schedule, prior to the start of construction.

D. UTILITY DELAYS

The Contractor shall notify the Engineer upon becoming aware that a Utility owner is not advancing the work in accordance with the approved utility schedule. Such notice shall be provided to the Engineer no later than seven (7) calendar days after the occurrence of the event that the Contractor believes to be a utility delay. After such notice, the Engineer and the Contractor shall continue to diligently seek the Utility Owner’s cooperation in performing their scope of Work.

In order to demonstrate that a critical path delay has been caused by a third-party Utility, the Contractor must demonstrate, through the requirements of the monthly Progress Schedule submissions and the supporting contract records associated with Subsection 8.02, 8.10 and 8.14, that the delays were beyond the control of the Contractor.

SUBSECTION 8.14 (Continued)

All documentation provided in this section is subject to the review and verification of the Engineer and, if required, the Utility Owner. In accordance with MassDOT Specifications, Division I, Subsection 8.10, a Time Extension will be granted for a delay caused by a Utility, only if the actual duration of the utility work is in excess of that shown on the Project Utility Coordination Form, and only if;

- 1) proper Notification of Delay was provided to MassDOT in accordance with the time requirements that are specified in this Section
- 2) the utility delay is a critical path impact to the Baseline Schedule (or most recently approved Progress Schedule)

E. LOCATION OF UTILITIES

The locations of existing utilities are shown on the Contract drawings as an approximation only. The Contractor shall perform a pre-construction utility survey, including any required test pits, to determine the location of all known utilities no later than thirty (30) calendar days before commencing physical site work in the affected area.

F. POST UTILITY SURVEY – NOTIFICATION

Following completion of a utility survey of existing locations, the Contractor will be responsible to notify the Engineer of any known conflicts associated with the actual location of utilities prior to the start of the work. The Engineer and the Contractor will coordinate with any utility whose assets are to be affected by the Work of this Contract. A partial list of utility contact information is provided in the Project Utility Coordination Form.

G. MEETINGS AND COOPERATION WITH UTILITY OWNERS

The Contractor shall notify the Engineer in advance of any meeting they initiate with a Utility Owner's representative to allow MassDOT to participate in the meeting if needed.

Prior to the Pre-Construction Meeting, the Contractor should meet with all Utility Owners who will be required to perform utility relocations within the first 6 months of the project, to update the affected utilities of the Project Utility Coordination Form and all other applicable Contract requirements that impact the Utilities. The Contractor shall copy the Engineer on any correspondence between the Utility Owner and the Contractor.

H. FORCE ACCOUNT / UTILITY MONITORING REQUIREMENTS

The Engineer will be responsible for recording daily Utility work force reports. The start, suspension, re-start, and completion dates of each of the Utilities, within each phase of the utility relocation work, will be monitored and agreed to by the Engineer and the Contractor as the work progresses.

I. ACCESS AND INSPECTION

The Contractor shall be responsible for allowing Utility owners access to their own utilities to perform the relocations and/or inspections. The Contractor shall schedule their work accordingly so as not to delay or prevent each utility from maintaining their relocation schedule.

COMPLIANCE WITH THE NATIONAL DEFENSE AUTJORIZATION ACT**(Supplementing Subsection 7.01)**

On all projects, the “Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment” Regulation (2 CFR 200.216) prohibits the Contractor from using or furnishing the following telecommunications equipment or services:

- Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
- For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- Telecommunications or video surveillance services provided by such entities or using such equipment.
- Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

This prohibition applies to all products manufactured by the aforementioned companies, including any individual components or parts.

By submitting a bid on a project, the Contractor certifies that all work will be in compliance with the terms of 2 CFR 200.216. The Contractor shall submit a COC indicating compliance with the above provisions for all telecommunications equipment or services included in the Contract.

Payment for the item in which the materials are incorporated may be withheld until these COCs are received. Any cost involved in furnishing the certificate(s) shall be borne by the Contractor.

NATIONAL GRID EMERGENCY TELEPHONE NUMBERS**GAS:**

Emergency: 1-800-233-5325

New Service: 1- 877-696-4743

Customer Support: 1-800-732-3400

EVERSOURCE EMERGENCY TELEPHONE NUMBERS**GAS:**

Outage/ Emergency: 800-592-2000

New Service: 866-678-2744

Customer Support: 800-592-2000

ELECTRIC:

Outage/ Emergency: 800-592-2000 or 844-726-7562

New Service: 1-888-633-3797 (1-888-need pwr)

Customer Support: 1-800-340-9822

BIDDERS LIST

Pursuant to the provisions of 49 CFR Part 26.11 all official bidders will be required to report the names, addresses and telephone numbers of all firms that submitted bids or quotes in connection with this project. Failure to comply with a written request for this information within 15 business days may result in a recommendation to the Prequalification Committee that prequalification status be suspended until the information is received.

The Department will survey all firms that have submitted bids or quotes during the previous year prior to setting the annual goal and shall request that each firm report its age and gross receipts for the year.

PIGEON WASTE

The Contractor shall remove and dispose of the pigeon waste and any other debris accumulated on the steel members and bridge seats in areas where work is being performed. Pigeon waste and debris material contaminants will require special handling and disposal in accordance with all Federal, state, and local requirements. No separate payment will be made for removal and disposal of pigeon waste. Cost shall be incidental to the contract pay items.

BUILD AMERICA BUY AMERICA PREFERENCE

On Federally-aid projects the Buy America (23.CFR § 635.410) and Build America, Buy America Act (Pub. L. No. 117-58, §§ 70901-52). requires the following,

- (1) all iron and steel used in the project are produced in the United States--this means all manufacturing processes, from the initial melting stage through the application of coatings, must occur in the United States. Foreign steel and iron can be used if the cost of the materials does not exceed 0.1% of the total Contract cost or \$2,500, whichever is greater. The action of applying a coating to a covered material (i.e., steel and iron) is deemed a manufacturing process subject to Buy America. Coating includes epoxy coating, galvanizing, painting and any other coating that protects or enhances the value of a material subject to requirements of Build America, Buy America. Steel used for temporary support of excavation, including H piles, soldier piles, and sheeting when the steel is required to be left in place is subject to requirements of Build America, Buy America. Temporary steel, shall remain in place when it falls within the influence zone of the soil supporting any structure or railroad tracks.
- (2) all manufactured products used in the project are produced in the United States—this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation; and
- (3) all construction materials are manufactured in the United States—this means that all manufacturing processes for the construction material occurred in the United States. “Construction materials” includes an article, material, or supply—other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives—that is or consists primarily of:
 - non-ferrous metals,
 - plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables),
 - glass (including optic glass),
 - lumber; or
 - drywall.

The Buy America preference only applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to an infrastructure project. As such, it does not apply to tools, equipment, and supplies, such as temporary scaffolding, brought to the construction site and removed at or before the completion of the infrastructure project. Nor does a Buy America preference apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished infrastructure project but are not an integral part of the structure or permanently affixed to the infrastructure project.

NOTE: The requirements for manufactured products indicated in paragraph (2) above are not in effect for this contract.

TRAFFIC OFFICERS AND RAILROAD FLAGGING SERVICE

(Supplementing Subsection 7.11)

Under the provisions of Chapter 634 of the Acts of 1971, the railroad (excluding MBTA) shall furnish, without cost, the necessary flag protection on the railroad right-of-way which may be required for the performance of the work. For MBTA railroad, MassDOT will pay the Contractor for flagging costs in accordance with the procedure described in Subsection 7.11.

For non-Chapter 634 bridges MassDOT will pay the Contractor for flagging costs in accordance with the procedure described in Subsection 7.11.

The Contractor, however, is responsible for all costs incurred in restoring tracks that have been disturbed by the Contractor's operations. Contractor shall comply with the requirements of the Railroad Special Provisions.

MBTA FLAGGING

The Contractor shall provide a minimum two week notice for flagging support for MBTA bridges and railroads. This applies only to bridges and railroads operated by Keolis Commuter Services (KCS). This two week notice does not apply to emergency work, only to routine or scheduled work activities. The contact person for advance request for flagging services is Rich Arnold, MBTA Railroad Operations Department, Phone number (617)-222-3635, email address: rarnold@mbta.com.

MBTA COMMUTER RAIL

Keolis Commuter Service (KCS) operates the commuter rail for the MBTA. All references to MBCR in the provisions will mean Keolis Commuter Service (KCS).

MBTA RAILROAD COORDINATION / ACCESS TO MBTA PROPERTY

The Contractor shall be required to coordinate the work of this Contract with the MBTA and Keolis Commuter Services Co. ("KCS") through the MassDOT Resident Engineer and MassDOT designated Field Staff. A majority of the prerequisites for the Contractor to perform work on or adjacent to MBTA transit lines may be found in the "MBTA Special Instructions" provided herein. The Contractor shall be required to comply with the all applicable requirements of the latest edition of the MBTA Special Instructions available at the time of Contract Award.

The Contractor will have to perform construction related activities on, over, under, within or adjacent to railroad property owned or controlled by the MBTA. Any work that will affect Commuter Rail operations, involve work on, over, under, within or adjacent to the commuter rail right of way must be coordinated with MBTA Railroad Operations and KCS and shall comply with the latest version of the MBTA Railroad Operations Directorate.

An owner or Contractor who wishes permission to enter upon or perform work over, on, under or adjacent to MBTA property shall submit to the offices of the MBTA's designated representative, a request in writing, a minimum of forty-two (42) days prior to the owner or the Contractor's planned commencement of any of the above stated activities.

MBTA COORDINATION – SUBSTITUTE BUSING

Substitute bus transportation will be required for weekend MBTA Commuter Rail shutdowns. The Contractor must coordinate with MBTA Operations Department for provision of bus service. The Contractor shall contact MBTA Operations Dept. a minimum of 6 weeks prior to any planned rail shutdown. The MBTA will be responsible for planning, procuring, and administering the necessary substitute bus transportation services and operations based on the Contractor's approved work schedule.

Prime Contact:

Eric Ciborowski
32 Cobble Hill Road
Somerville, MA 02143
617-634-2567
ECIBOROWSKI@MBTA.com

Secondary Contact:

Delrico Gomes
32 Cobble Hill Road
Somerville, MA 02143
857-366-0404
DGOMES@MBTA.COM

The Contractor shall be required to attend the MBTA Weekly Track Outage Schedule Coordination Meetings held Wednesdays at 10:00 am at 32 Cobble Hill Road in the small classroom located in the training area at the rear of the building.

SUPPLEMENTAL REQUIREMENTS FOR NON-BID ITEMS

(Supplementing Subsection 3.04)

The Contractor will be paid for additional artisans, equipment rental, materials, engineering services and specialty services required to perform the work plus (10%) percent, plus actual increased bond premium.

The Contractor shall be required to furnish certified paid receipts for additional artisans, equipment rental, materials, engineering services and specialty services that are required to perform the work prior to payment by the Department. Increased bond premium for additional artisans, equipment rental, materials, engineering services and specialty services will be paid after a certified paid receipt is submitted showing payment of the increased bond.

SECTION 722 CONSTRUCTION SCHEDULING

DESCRIPTION

722.20 General

The Contractor's approach to prosecution of the Work shall be disclosed to the Department by submission of a Critical Path Method (CPM) schedule and a cost/resource loaded Construction Schedule when required in this Subsection. These requirements are in addition to, and not in limitation of, requirements imposed in other sections.

The requirements for scheduling submissions are established based on the Project Value at the time of the bid and are designated as Type A, B, C or D. The definitions of these Schedule Requirement Types are summarized below. Complete descriptions of all detailed requirements are established elsewhere in this specification.

Type A – for all Site-Specific Contracts with a Project Value over \$20 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Resource-Loading
- Resources Graphic Reporting
- Cash Flow Projections from the CPM
- Cash Flow Charts
- Cost-loaded CPM
- Contractor-furnished CPM software, computer and training

Type B – for all Site-Specific Contracts with a Project Value between \$10 Million and \$20 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Cost-loaded CPM
- Resource-Loading
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software, computer and training

SECTION 722 (Continued)

Type C – for all Site-Specific Contracts with a Project Value between \$3 Million and \$10 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software, computer and training

Type D - for all contracts with a Project Value less than \$3 Million; various locations contracts of any dollar amount; contracts with durations less than one-hundred and eighty (180) Calendar Days; and other contracts as determined by the Engineer.

- Bar chart schedule updated monthly or at the request of the Engineer (See Section 722.62.B - Bar Charts.)
- Monthly Projected Spending Report (PSR) (See Section 722.62.F - Projected Spending Reports.)

MATERIALS, EQUIPMENT, PERSONNEL**722.40 General****A. Software Requirements** (Types A, B and C)

The Contractor shall use Primavera P6 computer scheduling software.

In addition to the requirements of Section 740 – Engineer’s Field Office and Equipment, the Contractor shall provide to the Department one (1) copy of the scheduling software, one (1) software license and one (1) computer capable of running the scheduling software for the duration of the Contract. This computer and software shall be installed in the Engineer’s Field Office within twenty-eight (28) Calendar Days after Notice to Proceed. The computer and software shall be maintained and serviced as recommended by the computer manufacturer and/or as required by the Engineer during the duration of the Contract at no additional cost to the Department. The Contractor shall provide professional training in the basic use of the software for up to eight (8) Department employees. The trainer shall be approved by the Engineer. This training shall be provided within twenty-eight (28) Calendar Days after Notice to Proceed.

B. Scheduler Requirements

For all schedule types, if the Contractor plans to use outside scheduling services, the scheduler shall be approved as a subcontractor by the Engineer.

For Type A, B and C Schedules the name of the Contractor’s Project Scheduler together with his/her qualifications shall be submitted to the Department for approval by the Engineer within seven (7) Calendar Days after NTP. The Project Scheduler shall have a minimum of five [5] years of project CPM scheduling experience, three [3] years of which shall be on projects of similar scope and value as the project for which the Project Scheduler is being proposed. References shall be provided from past projects that can attest to the capabilities of the Project Scheduler.

SECTION 722 (Continued)**CONSTRUCTION METHODS****722.60 General****A. Schedule Planning Session**

(Types A, B and C)

The Contractor shall conduct a schedule planning session within seven (7) Calendar Days after the Contractor receives the NTP and prior to submission of the Baseline Schedule. This session will be attended by the Department and its consultants. During this session, the Contractor shall present its planned approach to the project including, but not limited to:

1. the Work to be performed by the Contractor and its subcontractors;
2. the planned construction sequence and phasing; planned crew sizes;
3. summary of equipment types, sizes, and numbers to be used for each work activity;
4. all early work related to third party utilities;
5. identification of the most critical submittals and projected submission timelines;
6. estimated durations of major work activities;
7. the anticipated Critical Path of the project and a summary of the activities on that Critical Path;
8. a summary of the most difficult schedule challenges the Contractor is anticipating and how it plans to manage and control those challenges;
9. a summary of the anticipated quarterly cash flow over the life of the project.

This will be an interactive session and the Contractor shall answer all questions that the Department and its consultants may have. The Contractor shall provide a minimum of five (5) copies of a written summary of the information presented and discussed during the session to the Engineer. The Contractor's Baseline Schedule and accompanying Schedule Narrative shall incorporate the information discussed at this Schedule Planning Session.

B. Schedule Reviews by the Department (All Types)**1. Baseline Schedule Reviews**

The Engineer will respond to the Baseline Schedule Submission within thirty (30) Calendar Days of receipt providing comments, questions and/or disposition that either accepts the schedule or requires revision and resubmittal. Baseline Schedules shall be resubmitted within fifteen (15) Calendar Days after receipt of the Engineer's comments.

2. Contract Progress Schedule / Monthly Update Reviews

The Engineer will respond to each submittal within twenty one (21) Calendar Days. Schedules shall be resubmitted by the Contractor within five (5) Calendar Days after receipt of the Engineer's comments.

Failure to submit schedules as and when required could result in the withholding of full or partial pay estimate payments by the Engineer.

SECTION 722 (Continued)**722.61 Schedule Content and Preparation Requirements**
(Types A, B and C unless otherwise noted)

Each Contract Progress Schedule shall fully conform to these requirements.

A. LOGIC

The schedules shall divide the Work into activities with appropriate logic ties to show:

1. conformance with the requirements of this Section and Division I, Subsection 8.02 - Schedule of Operations
2. the Contractor's overall approach to the planning, scheduling and execution of the Work
3. conformance with any additional sequences of Work required by the Contract Documents, including, but not limited to, Subsection 8.03 - Prosecution of Work and Subsection 8.06 – Limitations of Operations.

B. ACTIVITIES

The schedules shall clearly define the progression of the Work from NTP to Contractor Field Completion (CFC) by using separate activities for each of the following items:

1. NTP
2. Each component of the Work defined by specific activities
3. Detailed activities to satisfy permit requirements
4. Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before purchasing
5. The preparation and submission of shop drawings, procedures and other required submittals, with a planned duration that is to be demonstrated to the Engineer as reasonable
6. The review and return of shop drawings, procedures and other required submittals, approved or with comments, the duration of which shall be thirty (30) Calendar Days, unless otherwise specified or as approved by the Engineer
7. Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third party work affecting the Contract
8. The Critical Path, clearly defined and organized
9. Float shall be clearly identified
10. Access Restraints – restrictions on access to areas of the Work that are defined by the Department in the bid package, in Subsection 8.06 – Limitations of Operations or elsewhere in the Contract
11. Milestones listed in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents
12. Subcontractor approvals at fifteen (15) Calendar Days from submittal to response
13. Full Beneficial Use (FBU) Contract Milestone per the requirements of Subsection 8.03 - Prosecution of Work
14. Contractor's request for validation of FBU (ready to open to traffic)
15. The Department's confirmation of completed work to allow for FBU

SECTION 722 (Continued)

16. Substantial Completion Contract Milestone per the requirements of Subsections 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes and 8.03 - Prosecution of Work
17. Contractor's request for validation of Substantial Completion
18. Punchlist Completion Period of at least thirty (30) Calendar Days per the requirements of Subsections 5.11 - Final Acceptance, 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes and 8.03 - Prosecution of Work
19. Contractor confirmation that all punchlist work and documentation has been completed
20. Physical Completion of the Work Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
21. Documentation Completion per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
22. Contractor Field Completion Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
23. Utility work to be performed in accordance with the Project Utility Coordination (PUC) Form as provided in Section 8.14 - Utilities Coordination, Documentation and Monitoring Responsibilities
24. Traffic work zone set-up and removal, night work and phasing
25. Early Utility Relocation (by others) that has been identified in the Contract
26. Right-of-Way (ROW) takings that have been identified in the Contract
27. Material Certifications
28. Work Breakdown Structure in accordance with the MassDOT-Highway Division Contractor Construction Schedule Toolkit located on the MassDOT-Highway Division website at:
<https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit>
29. For Type A and B Contracts only: All items to be paid, including all Unit Price and Lump Sum pay items, shall be identified by activity. This shall include all non-construction activities such as engineering work; purchase of permanent materials and equipment, purchase of structural steel stock, equipment procurement, equipment delivery to the site or storage location and the representative amount of overhead/indirect costs that was included in the Contractor's Bid Prices.

C. EARLY AND LATE DATES

Early Dates shall be based on proceeding with the Work or a designated part of the Work exactly on the date when the corresponding Contract Time commences. Late Dates shall be based on completing the Work or a designated part of the Work exactly on the corresponding Contract Time, even if the Contractor anticipates early completion.

SECTION 722 (Continued)**D. DURATIONS**

Activity durations shall be in Work Days. Planned Original Durations shall be established with consideration to resources and production rates that correspond to the Contractor's Bid Price. Within all of the Department-required schedules, the Contractor shall plan the Work using durations for all physical construction activities of no less than one (1) Work Day and no greater than fourteen (14) Work Days, unless approved by the Engineer as part of the Baseline Schedule Review.

Should there be an activity with a duration that is determined by the Engineer to be unreasonable, the Contractor will be asked to provide a basis of the duration using bid documents, historic production rates for similar work, or other form of validation that is acceptable to the Engineer. Should the Contractor and the Engineer be unable to agree on reasonable activity durations, the Engineer will, at a minimum, note the disagreement in the Baseline Schedule Review along with a duration the Engineer considers reasonable and the basis for that duration. A schedule that contains a substantial number of activities with durations that are deemed unreasonable by the Engineer will not be accepted.

E. MATERIALS ON HAND (for Types A and B only)

The Contractor shall identify in the Baseline Schedule all items of permanent materials (Materials On Hand) for which the Contractor intends to request payment prior to the incorporation of such items into the Work.

F. ACTIVITY DESCRIPTIONS

The Contractor shall use activity descriptions in all schedules that clearly describe the work to be performed using a combination of words, structure numbers, station numbers, bid item numbers, work breakdown structure (WBS) and/or elevations in a concise and compact label as specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit>

G. ACTIVITY IDENTIFICATION NUMBERS

The Contractor shall use the activity identification numbering system specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located online at the address above.

H. ACTIVITY CODES

The Contractor shall use the activity codes specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located online at the address above.

I. CALENDARS

Different calendars may be created and assigned to all activities or to individual activities. Calendars define the available hours of work in each Calendar Day, holidays and general or project-specific non-Work Days such as Fish Migration Periods, time of year (TOY) restrictions and/or area roadway restrictions.

SECTION 722 (Continued)

Examples of special calendars include, but are not limited to:

- Winter Shutdown Period, specific work is required by separate special provision to be performed during the winter. See Special Provision 8.03 (if applicable)
- Peak traffic hours on heavily traveled roadways. This shall be from 6:30 am to 9:30 am and from 3:30 pm to 7:00 pm, unless specified differently elsewhere in the Contract.
- Special requirements by sensitive abutters, railroads, utilities and/or other state agencies as defined in the Contract.
- Cape Cod and the Islands Summer Roadway Work Restrictions: A general restriction against highway and bridge construction is enforced between Memorial Day and Labor Day, unless otherwise directed by the Engineer. Refer to the Project Special Provisions for specific restrictions.
- Cape Ann Summer Roadway Work Restrictions: While there are no general restrictions for Cape Ann as there are for Cape Cod and the Islands, project-specific restrictions may be enforced. Refer to the Project Special Provisions for specific restrictions.
- Turtle and/or Fish Migration Periods and/or other in-water work restrictions: Refer to the Project Special Provisions for specific restrictions.
- Working over Waterways Restricted Periods: Refer to the Project Special Provisions for specific restrictions.
- Night-time paving and striping operations, traffic and temperature restrictions: Refer to the Project Special Provisions for specific restrictions.
- Utility Restrictions shall be as specified within the Contract.

J. FLOAT

For the calculation of float in the CPM schedule, the setting for *Retained Logic* is required for all schedule submissions, starting with the Baseline Schedule Submission. Should the Contractor have a reason to propose that an alternative calculation setting such as *Progress Override* be used, the Contractor shall obtain the Engineer's approval prior to modifying to this setting.

K. COST AND RESOURCE LOADING (Types A and B only)

For all Type A and B Schedules, the Contractor shall provide a cost and resource-loaded schedule with an accurate allocation of the costs and resources necessary to complete the Work. The costs and resources shall be assigned to all schedule activities in order to enable the Contractor to efficiently execute the Contract requirements and the Engineer to validate the original plan, monitor progress, provide cash flow projections and analyze delays.

1. Each schedule activity shall have an assigned cost that accurately represents the value of the Work. Each schedule activity shall have its resources assigned to it by craft and the anticipated hours to accomplish the work. Each schedule activity's equipment resources shall be assigned to it by equipment type and hours operated. Front-loading or other unbalancing of the cost distribution will not be permitted.
2. The sum of the cost of all schedule activities shall be equal to the Contractor's Bid Price.
3. Indicating the labor hours per individual, per day, by craft and equipment hours/day will be acceptable.

SECTION 722 (Continued)

4. The Engineer reserves the right to use the cost-loading as a means to resolve changes, disputes, time entitlement evaluations, increases or decreases in the scope of Work, unit price renegotiations and/or claims.
5. For all Type A and B Schedules, all subnets, fragnets, Proposal Schedules, and Recovery Schedules shall be cost and resource- loaded to help to quickly validate and monitor the duration of the Work to be performed.
6. For Type A Schedules, cost-loading of the schedule will also be used for cash flow projection purposes.
7. The cost-loading of each activity shall indicate the portion of the cost for that activity that is applicable to a specific bid item (cost account.) The total cost for each cost account must equal the bid item price.
8. For Type A Schedules, each month, the Contractor will be paid using the Cost-loaded CPM activities for Lump Sum payment items. This requirement supersedes any requirements elsewhere in this Contract regarding partial payments of schedule-of-values for all Lump Sum items.

L. NOT TO BE USED IN THE CONTRACTOR'S CPM SCHEDULE

1. Milestones or constraint dates not specified in the Contract
2. Scheduled work not required for the accomplishment of a Contract Milestone
3. Use of activity durations, logic ties and/or sequences deemed unreasonable by the Engineer
4. Delayed starts of follow-on trades
5. Float suppression techniques

722.62 Submittal Requirements

All schedules shall be prepared and submitted in accordance with the requirements listed below.

Each monthly Contract Progress Schedule submittal shall be uniquely identified.

Except as stated elsewhere in this subsection, schedule submittals shall include each of the documents listed below, prepared in two formats, for distribution as follows:

- a. four (4) compact discs (CD); one (1) each for the Office of Project Controls and Performance Oversight (O-PC&PO), the Boston Construction Section Office, the District Construction Office and the Resident Engineer's Office. Additional copies shall be required if the work is performed in more than one district.
- b. two (2) hard copies plotted in color on 24" X 36" paper; one (1) copy each for the District Construction Office and the Resident Engineer's Office. No copies for the O-PC&PO and the Boston Construction Section Office. Additional copies shall be required if the work is performed in more than one district.

SECTION 722 (Continued)**A. Narratives**

A written narrative shall be submitted with every schedule submittal. The narrative shall:

1. itemize and describe the flow of work for all activities on the Critical Path in a format that includes any changes made to the schedule since the previous Contract Progress Schedule / Monthly Update or the Baseline Schedule, whichever is most recent;
2. provide a description of any specification requirements that are not being followed. Identify those that are improvements and those that are not considered to be meeting the requirements;
3. provide all references to any Notice of Delay that has been issued, within the time period of the Contract Progress Schedule Update, by letter to the Engineer. Note that any Notice of Delay that is not issued by letter will not be recognized by the Engineer. See Subsection 722.64.A - Notice of Delay;
4. provide a description of each third-party utility's planned vs. actual progress and note any that are trending late or are late per the durations and commitments as provided in the PUC Form; provide a description of the five (5) most important responses needed from the Department and the need date for the responses in order to maintain the current Schedule of Record;
5. provide a description of all critical issues that are not within the control of the Contractor or the Department (third party) and any impact they had or may have on the Critical Path;
6. provide a description of any possible considerations to improve the probability of completing the project early or on-time;
7. compare Early and Late Dates for activities on the Critical Path and describe reasons for changes in the top three (3) most critical paths ;
8. describe the Contractor's plan, approach, methodologies and resources to be employed for completing the various operations and elements of the Work for the top three (3) most critical paths. For update schedules, describe and propose changes to those plans and verify that a Proposal Schedule is not required;
9. describe, in general, the need for shifts that are not 5 days/week, 8 hours/day, the holidays that are inserted into each calendar and a tabulation of each calendar that has been used in the schedule;
10. describe any out-of-sequence logic and provide an explanation of why each out-of-sequence activity does not require a correction, if one has not been provided, and an adequate demonstration that these changes represent the basis of how these activities will be built, including considerations for resources, dependencies and previously-approved production rates;
11. identify any possible duration increases resulting from actual or anticipated unit price item quantity overruns as compared to the baseline duration, with a corresponding suggestion to mitigate any possible delays to the Critical Path. If the delay is anticipated to impact the Critical Path, refer to Subsections 4.06 - Increased or Decreased Contract Quantities and 8.10 - Determination and Extension of Contract Time for Completion and submit a letter to the Engineer notifying of a potential delay;
12. include a schedule log consisting of the name of the schedule, the data date and the date submitted.

SECTION 722 (Continued)**B. Bar Charts (Types A, B, C and D)**

One (1) time-scaled bar chart containing all activities shall be prepared and submitted using a scale that yields readable plots and that meets the requirements of Subsection 722.61 - Schedule Content and Preparation Requirements. Activities shall be linked by logic ties and shown on their Early Dates. Critical Paths shall be highlighted and Total Float shall be shown for all activities.

A second time-scaled bar chart shall also be prepared containing only the Critical Path or, if the Critical Path is not the longest path, the Longest Path using a scale that yields readable plots and that meets the requirements of Subsection 722.61 - Schedule Content and Preparation Requirements. Activities shall be linked by logic ties and shown on their Early Dates. Total Float shall be shown for all activities.

Bar Charts shall be printed in color and submitted on 11" X 17" paper or, if approved by the Engineer, as a .pdf file.

C. Detailed Activity Schedule Comparisons

A Detailed Activity Schedule Comparison (DASC) is a simple reporting tool in the format of a graphical report that will provide Resident Engineers with immediate, timely and up-to-date information. The DASC consists of an updated bar chart that overlays the current time period's bar chart onto the previous time period's bar chart for an easily-read comparison of progress during the present and previous reporting periods. The DASC shall be prepared and submitted in accordance with the instructions contained in the Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit>

The reports described in Subsections D, E and F below shall be submitted with all of the schedules listed in Subsection 722.20 - General:

D. Activity Cost Report and Monthly Cash Flow Projections (Type A only)

With each Contractor Quantity Estimate (CQE), the Contractor shall submit an Activity Cost Report and Cash Flow Projection that includes all activities grouped by Contract Bid Item.

The Activity Cost Report shall be generated from the Schedule of Record and shall be the basis of the Monthly Cash Flow Projection. Within each contract Bid Item, activities shall be sequenced by ascending activity identification number and shall show:

1. activity ID and description,
2. forecast start and finish dates for each activity and,
3. when submitted as a revised schedule, actual start and finish dates for each completed activity.

For Unit Price pay items, in addition to the above, estimates to complete and any variance to the estimated Contract quantity shall be shown.

E. Resource Graphs (Type A only)

Monthly and cumulative resource graphs for the remaining Contract period using the Early Dates and Late Dates in the Contract Progress Schedule shall be included as part of each schedule submittal.

SECTION 722 (Continued)**F. Projected Spending Reports (Types B, C and D)**

A Projected Spending Report (PSR) shall be prepared and submitted in accordance with the instructions listed at the end of this section. The PSR shall indicate the monthly spending (cash flow) projection for each month from NTP to Contractor Field Completion (CFC). Each month's actual spending shall be calculated using all CQEs paid during that month. If the difference between the Contractor's monthly projections vs. the actual spending is greater than 10%, the Contractor's monthly spending projection shall be revised and resubmitted within fifteen (15) Calendar Days.

The Projected Spending Report (PSR) shall be depicted in a tabular format and printed in color on 11 x 17-sized paper or larger as approved by the Engineer. For additional instructions and a template for preparing the Projected Spending Report (PSR), refer to the Contractor's Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit> or consult with the District Construction Scheduler.

722.63. Progress Schedule Requirements**A. Baseline Schedule**

The Baseline Schedule shall be due thirty (30) Calendar Days after Notice to Proceed (NTP.) The Baseline Schedule shall only reflect the Work awarded to the Contractor and shall not include any additional work involving Extra Work Orders or any other type of alleged delay. The Baseline Schedule shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements. Once the Baseline Schedule has been accepted by the Engineer, with or without comments, it shall represent the as-planned schedule for the Work and become the Contract Progress Schedule of Record until such time as the schedule is updated or revised under Subsections 722.63.C - Contract Progress Schedules / Monthly Updates, 722.64.C - Recovery Schedules and 722.64.D - Proposal Schedules.

The Cost and Resource-Loading information (Types A and B only) shall be provided by the Contractor within forty-five (45) Calendar Days after NTP.

The Engineer's review comments on the Baseline Schedule and the Contractor's responses to them will be maintained for the duration of the Contract and will be used by the Engineer to monitor the Contractor's work progress by comparing it to the Contract Progress Schedule / Monthly Update.

B. Interim Progress-Only Schedule Submissions

The first monthly update of the Contract Progress Schedule/Monthly Update is due within seventy (70) Calendar Days after Notice to Proceed (NTP.) The Baseline Schedule review period ends at sixty (60) Calendar Days after NTP, see Subsection 722.60.B - Schedule Reviews by the Department. If the Baseline Schedule has not been accepted within sixty (60) Calendar Days after NTP, an Interim Progress-Only Schedule shall be due within seventy (70) Calendar Days after NTP. The purpose of the Interim Progress-Only Schedule is to document the actual progress of all activities, including non-construction activities, from NTP until the Baseline Schedule is accepted.

SECTION 722 (Continued)**C. Contract Progress Schedules / Monthly Updates (Types A, B, C and D)**

The first Contract Progress Schedule shall be submitted by the Contractor no later than seventy (70) Calendar Days after NTP. The data date for this first Progress Schedule shall be sixty (60) Calendar Days after NTP. Subsequent Progress Schedules shall be submitted monthly.

Each Contract Progress Schedule shall reflect progress up to the data date. Updated progress shall be limited to as-built sequencing and as-built dates for completed and in-progress activities. As-built data shall include actual start dates, remaining Work Days and actual finish dates for each activity, but shall not change any activity descriptions, the Original Durations, or the Original Resources (as planned at the time of bid), without the acceptance of the Engineer. If any activities have been completed out-of-sequence, the Contractor shall propose new logic ties for affected in-progress and future activities that accurately reflect the previously-approved sequencing. Alternatively, the Contractor may submit to the Engineer for approval an explanation of why an out-of-sequence activity does not require a correction and an adequate demonstration that the changes accurately represent how the activities will be built, including considerations for resources, dependencies and previously approved production rates. Once approved by the Engineer, the Contractor may incorporate the changes in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

No revisions to logic ties; sequence, description or duration of future activities; or planned resource costs shall be made without prior approval by the Engineer.

Any proposed logic changes for in-progress or future activities shall be submitted to the Engineer for approval before being incorporated into a Contract Progress Schedule. The logic changes must be submitted using a Proposal Schedule or a schedule fragnet submission. Once approved by the Engineer, the Contractor may incorporate the logic in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

For any proposed changes to the original sequence, description or duration of future activities, the Contractor shall submit to the Engineer for approval an explanation of how the proposed description or duration change reflects how the activity will be progressed, including considerations for resources and previously approved production rates. Any description or duration change that does not accurately reflect how the activity will be progressed will not be approved by the Engineer. Once approved by the Engineer, the Contractor may incorporate the changes in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

Except as otherwise designated by a Contract Modification, no Contract Progress Schedule that extends performance beyond the Contract Time and/or beyond any Contract Milestone shall be approved by the Engineer. The Contractor shall submit a Recovery Schedule if any Contract Progress Schedule/Monthly Update indicates a failure to meet the Contract Dates.

D. Short-Term Construction Schedule

The Contractor shall provide a Short-Term Construction Schedule that details daily work activities, including any multiple shift work that the Contractor intends to conduct, in a bar chart format. The daily activities shall directly correspond to the Contract Progress Schedule activities, with a matching reference to the activity identification number in the Contract Progress Schedule, and may be at a greater level of detail.

SECTION 722 (Continued)

The Short-Term Construction Schedule shall be submitted every two weeks. It shall display all work for a thirty-five (35) Calendar Day period consisting of completed work for the two (2) week period prior and all planned work for the following three (3) week period. The initial submission shall be provided no later than thirty (30) Calendar Days after NTP or as required by the Engineer.

The Contractor shall be prepared to discuss the Short-Term Construction Schedule, in detail, with the Engineer in order to coordinate field inspection staff requirements, the schedule of work affecting abutters and any corresponding work with affected utilities. Short-Term Construction Schedules shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements.

Failure to submit Short-Term Construction Schedules every two (2) weeks may result in withholding of full or partial payments by the Engineer.

722.64 Impacted Schedule Requirements**A. Notice of Delay**

The Contractor shall notify the Engineer in writing, with copies to the District and State Construction Engineers, within three (3) Calendar Days of the start of any delays to the Critical Path that are caused by actions or inactions that were not within the control of the Contractor. Delay notifications that are not provided in a letter to the Engineer, such as a delay notification in the schedule narrative, will not be recognized as contractual notice in the determination of any Time Extension related to the impacts to the work associated with this specific alleged delay. Should such delay continue for more than one (1) week, the Contractor shall note it in the Schedule Narrative until the delay is no longer impacting the Critical Path for the completion of the Contract Milestones. The Engineer will evaluate the alleged delay and its impact and will respond to the Contractor within ten (10) Calendar Days after receipt of a notice of delay.

B. Time Entitlement Analysis

A Time Entitlement Analysis (TEA) shall consist of a descriptive narrative, prepared in accordance with Subsection 722.62.A - Narratives, and an as-built CPM schedule, which may be in the form of a schedule fragnet (that has been developed from the project's Contract Progress Schedule of Record, and illustrates the impact of a delay to the Critical Path, Contract Milestones and/or Contract Completion Date as required in Subsection 8.10 - Determination and Extension of Contract Time for Completion. TEAs shall also be used to determine the schedule impact of proposed Extra Work Orders (EWO) as also required in Subsection 8.10.

TEAs shall be prepared and submitted in accordance with the requirements of Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements and shall be based on the Contract Progress Schedule of Record applicable at the start of the delay or impact from an EWO. A TEA fragnet must start with a specific new activity describing the work contained in either a Notice of Delay previously submitted to the Department per Subsection 722.64.A - Notice of Delay or an EWO.

SECTION 722 (Continued)

TEAs shall be submitted:

1. as part of any Extra Work Order that may impact Contract Time,
2. with a request for a Time Extension,
3. within fourteen (14) Calendar Days after a request for a TEA by the Engineer for any other reason.

A TEA shall be submitted to the Engineer before any Time Extension is granted to the Contractor. Time Extensions will not be granted unless the TEA accurately reflects an evaluation of all past delays and the actual events that occurred that impacted the Critical Path. The TEA must also demonstrate a plan for the efficient completion of all of the remaining work through an optimized CPM Schedule. The analysis shall include all delays, including Contractor-caused delays, and shall be subdivided into timeframes and causes of delays.

TEAs shall incorporate any proposed activities, logic ties, resource considerations, and activity costs required to most efficiently demonstrate the schedule impacts in addition to detailing all impacts to existing activities, logic ties, the Critical Path, Contract Milestones and the Contract Completion Date. In addition, TEAs shall accurately reflect any changes made to activities, logic ties, restraints and activity costs, necessitated by an Extra Work Order or other schedule impact, for the completion of the remaining work. The Contractor shall provide TEAs that demonstrate that all delays have been mitigated to the fullest extent possible without requiring an Equitable Adjustment to the original bid basis.

All TEAs shall clearly indicate any overtime hours, additional shifts and the resource that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts. The Engineer shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of Time Extensions if it is determined to be in the best interest of the Department to do so.

When accepted, the changes included in a TEA shall be incorporated into the next Contract Progress Schedule per the requirements of Subsection 722.63.C - Contract Progress Schedules / Monthly Updates.

During the review of any TEA, all Contract Progress Schedules shall continue to be submitted as required.

The Engineer may request that the Contractor prepare a Proposal Schedule or a Recovery Schedule to further mitigate any delays that are shown in the accepted TEA/Contract Progress Schedule.

C. Recovery Schedules

The Contractor shall promptly report to the Engineer all schedule delays during the prosecution of the Work. Except as otherwise designated by a Contract Modification, no Contract Progress Schedule that extends performance beyond the Contract Time and/or beyond any Contract Milestone shall be approved by the Engineer. The Contractor shall submit a Recovery Schedule within fourteen (14) Calendar Days of a Contract Progress Schedule submission that shows failure to meet the Contract Dates. This requirement is critical to the Department's ability to make informed decisions regarding Contract Time and costs.

SECTION 722 (Continued)

During the prosecution of the Work, should the Contractor's progress on a critical operation clearly not meet anticipated production, without cause by fault of the Department, or should a critical activity or series of activities not be staffed in accordance with the Contractor's approved Baseline Schedule resource planning, the Contractor shall be obligated to recover such delay. Recovery Schedules shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements within fourteen (14) Calendar Days of any of the cases listed above.

Recovery Schedules shall clearly indicate any proposed overtime hours, additional shifts, and the resources that are proposed to be incorporated in to the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts and shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of Time Extensions, without additional compensation for any Contractor delays, if it is determined to be in the best interest of the Department to do so.

During the review of any Recovery Schedule, all Contract Progress Schedules shall continue to be required every month.

The Engineer may request that the Contractor prepare a Recovery Schedule to further mitigate any delays that are shown in an accepted TEA/Contract Progress Schedule.

Changes represented in accepted Recovery Schedules shall be incorporated into the next Contract Progress Schedule.

D. Proposal Schedules

A Proposal Schedule is an alternative schedule used to evaluate proposed changes to the Contract scope or significant alternatives to previously approved approaches to complete the Work, which may include changes to activity durations, logic and sequence. For Types A and B Schedules, the Proposal Schedule shall be cost and resource-loaded.

A Proposal Schedule may be requested by the Department at any time or may be offered by the Contractor. The Engineer may request that the Contractor prepare a Proposal Schedule to further mitigate any delays that are shown in an accepted TEA/Contract Progress Schedule.

The Contractor shall submit the Proposal Schedule within thirty (30) Calendar Days of a request from the Department.

The Proposal Schedule shall not be considered a Schedule of Record until the logic, durations, narrative and basis of the Proposal Schedule have been accepted by the Engineer. If the Proposal Schedule took the form of a fragnet, it must be incorporated into the Contract Progress Schedule of Record showing the current progress of all other activities and the impacts/results of the changes made by the Proposal Schedule before the Proposal Schedule is accepted by the Department.

Proposal Schedules shall clearly indicate any proposed overtime hours, additional shifts, and the resources that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts.

Changes represented in accepted Proposal Schedules shall be incorporated into the next Contract Progress Schedule. During the review of any Proposal Schedule, all Contract Progress Schedules shall continue to be required every month.

SECTION 722 (Continued)**E. Disputes (Types A, B, C and D)**

All schedules shall be submitted, reviewed, dispositioned and accepted in the timely manner specified herein so as to provide the greatest possible benefit to the execution of this Contract.

Any dispute concerning the acceptance of a schedule or any other question of fact arising under this subsection shall be determined by the Engineer. Pending resolution of any dispute, the last schedule accepted by the Engineer will remain the Contract Schedule of Record.

COMPENSATION**722.80 Method of Measurement and Basis of Payment (Types A, B, C and D)**

The Special Provisions will specify the fixed-price amount to be paid to the Contractor for the Project Schedule requirements contained herein. Each bidder shall include this lump-sum, fixed-price bid item amount in his/her bid. Failure to do so may be grounds for the rejection of the bid.

All required schedule-related work, including, but not limited to computers, computer software, the planning and coordination with utilities, training, schedule preparation and schedule submittals will be paid for under the fixed price amount.

This fixed price amount is for payment purposes only and is separate from what the Department considers to be the Contractor's General Condition costs. If the Contractor deems it necessary to include additional costs to provide all of the requirements of this section, these additional costs shall be included in the Contractor's overall bid price.

Twenty percent (20%) of this pay item will be paid upon the Engineer's acceptance of the Contractor's Baseline Schedule, prepared and submitted in accordance with Subsection 722.63.A.

The remaining eighty percent (80%) of this pay item will be paid in equal monthly installments distributed across the Contract Duration from Notice to Proceed (NTP) to Contractor Field Completion (CFC), less the 2 months required for the submittal and review of the Baseline Schedule in accordance with the following formula:

$$\text{Monthly Payment} = \frac{\text{Remaining Fixed Price amount (80\% of Item 100.)}}{\text{Contract Duration in whole months} - 2 \text{ months}}$$

The timely and accurate submission of the Baseline Schedule is critical to the Contract and the Department's ability to make informed decisions. Only payments under Item 740 - Engineer's Field Office and Item 748 - Mobilization will be made until the Baseline Schedule is accepted by the Engineer.

SECTION 722 (Continued)

No payment for any other pay item will be processed beyond seventy-five (75) Calendar Days from Notice to Proceed (NTP) until the Baseline Schedule is accepted by the Engineer. Until the Engineer's acceptance of the Baseline Schedule, the combined total of all payments made to the Contractor will be limited to an amount no greater than the total price for Item 748 - Mobilization or 3% of the contract price, whichever is less.

All Contract Progress Schedule Updates submitted later than ten (10) Calendar Days after the CQE (Contract Quantity Estimate) completion date, or greater than forty (40) Calendar Days from the Data Date of the previous submission, will be deemed to be no longer useful and will not qualify for payment. Late submittal of missed Contract Progress Monthly Updates will not result in recovery of the previously forfeited portion of the Schedule of Operations Fixed Price Payment Item.

Failure to submit schedules as and when required may result in the forfeiture of that portion of the Schedule of Operations Fixed Price Payment and/or the withholding of the full or partial CQE payments by the Engineer.

Failure to submit schedules that are acceptable to the Engineer may result in the forfeiture of that portion of the Schedule of Operations Fixed Price Payment and/or the withholding of the full or partial CQE payments by the Engineer.

The Schedule of Operations pay item will be adjusted to pay for only the actual quantity of schedules that have been submitted in accordance with this section.

The Contractor's failure or refusal to comply with the requirements of this Section shall be reasonable evidence that the Contractor is not prosecuting the Work with due diligence and may result in the withholding of full or partial payments by the Engineer.

Should there be a Time Extension granted to the Contractor, the Engineer may provide an Equitable Adjustment for additional Contract Progress Schedule Updates at intervals directed by the Engineer. Item 100. will be the basis for this Equitable Adjustment.

722.82 Payment Items

100. SCHEDULE OF OPERATIONS - FIXED PRICE \$ _____ LUMP SUM

ITEM 100. EXCLUSION

ITEM 100. is excluded from this project.

All costs associated with SECTION 722 are the responsibility of the Contractor and shall be considered incidental to the cost of the project, and no additional compensation will be allowed

ITEM 127.1
ITEM 127.41**REINFORCED CONCRETE EXCAVATION**
REINFORCED CONCRETE DECK EXCAVATION
(PARTIAL DEPTH)**CUBIC YARD**
CUBIC YARD

The work under Items 127.1 and 127.41 shall conform to the relevant provisions of Subsection 120 of the Standard Specifications and the following:

The work under these Items shall consist of partial depth removal and satisfactory disposal of all disintegrated or otherwise unsatisfactory reinforced concrete from the bridge deck. For locations refer to Document A00803 Sketches.

Prior to excavation, the Contractor shall cover all drainage structures that may be affected by the work. The structures shall remain covered until the new concrete has set and the area has been cleaned.

The Contractor shall take all precautions necessary not to damage that portion of the deck, including reinforcing steel, which is to remain. This includes determining the concrete cover to the steel bars at the edge of each patch prior to excavating concrete.

The edges of all areas where concrete is removed under Items 127.1 and 127.41 shall be cut to neat lines by saw cutting or by methods approved by the Engineer, to a depth of 1 inch, and all costs in connection with such work shall be incidental to the pertinent item. Patch areas shall be made rectangular in shape [as much as possible], with horizontal and vertical edges and square corners.

In case the reinforcing bars are exposed, the minimum depth of all cement concrete areas to be excavated shall be one (1) inch below the bottom of the top layer of longitudinal reinforcing steel throughout the entire excavated area. No concrete shall be placed until approval of the Engineer is given.

Surface preparation and concrete removal equipment shall be of the following types:

Pneumatic and Power-Driven Chipping Hammers:

In no event shall any pneumatic or power hammer weighing in excess of twenty-five (25) pounds be used for the removal of concrete. The Contractor will be restricted to fifteen (15) pound chipping hammers when removing concrete from below any reinforcing bar.

Abrasive Blasting Equipment:

Abrasive blasting equipment shall be capable of removing rust and old concrete from exposed reinforcing steel when deemed necessary by the Engineer.

During the prosecution of this work, the Engineer may reject the use of any method or equipment which causes undue vibration or possible damage to the structure or any part thereof.

Bobcats/Skid Steers will be allowed only to collect debris from the deck surface and will not be allowed to remove concrete from the patch area. All concrete debris shall be removed by hand or by using hand tools. The smaller pieces may be blown out using an oil free compressed air after first being wetted with water to control airborne particulates.

ITEMS 127.1 and 127.41 (Continued)

Also, included under these Items are all costs in connection with the cleaning, cutting, and bending of the existing reinforcing steel designated to be retained in the proposed construction. Any existing reinforcing steel damaged or otherwise made unsatisfactory for continued use as a result of the Contractor's operations shall be replaced at the Contractor's expense. All reinforcing steel with active rusting encountered in the excavation shall be thoroughly cleaned by abrasive blasting and coated with a zinc-rich primer conforming to MassDOT Spec. No. M7.04.11 or as directed by the Engineer. Any reinforcing steel that is unsuitable for further use through no fault of the Contractor shall be replaced under Item 910.1. All reinforcing steel that is loose shall be tied tightly together using wire ties. Ties are required at every other intersection of transverse and longitudinal reinforcing.

Temporary Protective Shielding must be used when, in the opinion of the Engineer, there is the possibility of dislodging concrete from the bottom of the deck.

Immediately before placement of new concrete, the exposed area to be patched shall be free of foreign materials. These materials shall be removed by abrasive blasting and by use of oil free compressed air. No grease, dust, rust, or laitance will be allowed to remain on reinforcing steel and exposed concrete surfaces.

The Contractor shall take all measures necessary to protect pedestrian, vehicular traffic, waterway, or railroad below from the construction operations. No debris, tools or incidental equipment of any kind will be permitted to fall into areas where vehicular or pedestrian traffic exists. Any material that accidentally falls into such areas shall be removed immediately.

METHOD OF MEASUREMENT

Items 127.1 and 127.41 will be measured for payment by the Cubic Yard, of concrete excavated and disposed.

BASIS OF PAYMENT

Items 127.1 and 127.41 will be paid for at the respective Contract unit prices per Cubic Yard, which price shall include all labor, materials, equipment, removal of bituminous concrete and waterproof membrane, sawcutting, and all incidental costs required to complete the work.

Item 127.1 will compensate the Contractor for excavation performed on sidewalks, parapets, and when deck excavation is within 3 feet from joint centerline.

Item 127.41 will compensate the contractor for excavation performed on the bridge deck partial depth.

In no case will the Contractor be compensated under more than one Item for the same excavated material.

ITEM 127.12**REINFORCED CONCRETE SUBSTRUCTURE
EXCAVATION****CUBIC YARD**

The work under this Item shall conform to the relevant Provisions of Subsection 120 of the Standard Specifications and the following:

The work under this Item consists of the removal and disposal of all deteriorated, spalled, and scaled concrete as required to repair the existing concrete substructure elements to the general lines identified on the drawings and as directed by the Engineer.

During the prosecution of the Work, the Engineer may reject the use of any method or equipment which causes undue vibration or possible damage to the structure or any part thereof. Pneumatic hammers heavier than the nominal 25 pounds mass shall not be used unless approved by the Engineer.

Minimum depth of excavation to sound concrete shall be one inch (1") beyond the inner most layer of reinforcing steel, but not less than four inches (4") from the original surface. The Contractor shall stop excavating deteriorated concrete when the depth of excavation reaches six inches (6") and shall notify the Engineer immediately. The edges of the patch shall be cut to neat lines by saw cutting or by methods approved by the Engineer, and the patch areas shall be made rectangular in shape, if possible, with horizontal and vertical edges and avoid over cutting square corners.

The Contractor shall limit extent of excavation of the pier caps and columns as shown on the repair sequence contract drawings. If the Contractor exceeds the limits of excavation as shown on the repair sequence contract drawings, then temporary shoring shall be installed to alleviate loading on the substructure, at no additional cost to the Department. The Contractor may submit an alternate method of reinforced concrete excavation to be approved by the Engineer. The alternate method, if approved by the Engineer, shall not incur any additional costs to the Department, and Item 127.12 Reinforced Concrete Substructure Excavation will be paid at the contract unit price regardless of the method used to complete the work.

The Contractor shall take all precautions necessary so as not to damage those portions of the bridge including reinforcing steel that are to remain. This includes determining the concrete cover to the steel bars at the edge of each patch prior to excavating concrete. Any steel that is unsuitable for further use through no fault of the Contractor shall be replaced under Item 910.1 Steel Reinforcement for Structures – Epoxy Coated. All reinforcing steel that is loose shall be tied tightly together using epoxy coated wire ties.

Also, included under this Item are all costs in connection with the cleaning, cutting, and bending of the existing reinforcing steel designated to be retained in the proposed repair. Immediately before preparation for placement of new concrete, the exposed reinforcing steel and concrete area to be patched shall be free of all oil, grease, rust or other foreign materials. These materials shall be removed by abrasive blasting or other methods approved by the Engineer.

ITEM 127.12 (Continued)**PREPARATION FOR PLACEMENT OF NEW CONCRETE**

Before placing new concrete, the existing surface must be cleaned with oil-free compressed air. After the surface preparation has been accepted, every effort should be made to thoroughly wet the concrete surface and all porous surfaces to be in contact with new concrete for 24 hours. This may be accomplished by continuous wetting with soaker hoses or the use of burlap/burlene, etc., where moisture can be maintained. If, in the opinion of the Engineer, conditions or the situation prohibits this, then the surfaces should be wetted for as long as possible. Surfaces must be wetted by a means acceptable to the Engineer using potable water. Preparation of concrete surfaces incidental to Item 905.

The Contractor shall remove any puddles of free-standing water with oil-free compressed air, and protect the surfaces from drying, so the existing concrete remains in a clean, saturated surface dry (SSD) condition until placement of the new concrete.

The Contractor shall take all measures necessary to protect pedestrian and vehicular traffic from the construction operations. No debris, tools or incidental equipment of any kind will be permitted to fall into river bed or river bank areas or where vehicular or pedestrian traffic exists. Any material that accidentally falls into such areas shall be removed immediately.

DISPOSAL OF EXCAVATED MATERIALS AND SITE CLEANING

Surplus materials obtained from reinforced concrete excavation and not needed for further use, as determined by the Engineer, shall become the property of the Contractor and shall be properly disposed of by the Contractor outside the location at no additional compensation.

The Contractor is required to broom clean all work site areas after the removal of excavated debris regardless of preexisting conditions. This includes areas under the excavated repair area such as at river bed, river bank, or revetment areas. Removal of debris, site cleaning, and disposal of debris are incidental to the Contract and no additional payment will be made.

METHOD OF MEASUREMENT

Item 127.12 will be measured per Cubic Yard of substructure concrete excavated, removed, and disposed of.

BASIS OF PAYMENT

Item 127.12 will be paid for at the Contract unit price per Cubic Yard, which price shall include all labor, materials, equipment, sawcutting, excavation, disposal, and all incidental costs required to complete the work.

ITEM 481.45**ELASTOMERIC CONCRETE****CUBIC FOOT**

The work under this item consists of furnishing and installation of elastomeric concrete on the existing structures at locations indicated on the contract drawings, and/or as required by the Engineer.

Materials

The elastomeric concrete shall consist of a two (2) component polyurethane material and shall be in conformance with section M 4.07.0 of the Standard Specifications.

Construction Methods

The Contractor shall remove the existing concrete or pavement to the depth indicated on the Plans and all deteriorated or spalled materials in the areas. The Contractor shall have the approval of the Engineer certifying that all spalled or deteriorated concrete has been removed prior to repairing the deteriorated areas.

Concrete at the edges of all areas to be patched shall have a vertical sawcut edge to a minimum depth of one half (1/2) inch prior to the application of the mortar.

The surface of the patch areas shall be thoroughly cleaned and shall be free of foreign materials. These materials shall be removed by abrasive blasting and/or by use of oil free compressed air. No grease, dust, rust, or laitance will be allowed to remain on reinforcing steel and exposed concrete surfaces.

The surface preparation and mixing/pouring of the elastomeric concrete shall be completed in accordance with the manufacturers written procedures. The equipment used for the mixing and placement of the elastomeric concrete shall be supplied by the manufacturer or shall be approved by the manufacturer. The mixing and placement of elastomeric concrete shall be in accordance with the manufacturers written instructions. Proper consolidation of the elastomeric concrete shall be achieved around all embedded elements. If required by the manufacturer, bonding agent must be applied to the patch area prior to the installation of the elastomeric concrete. The aggregate component and the liquid component of the elastomeric concrete shall be thoroughly mixed until all aggregate is completely coated (approximately 1 minute).

ITEM 481.45 (Continued)**Manufacturer's Field Representative**

1. The Contractor shall arrange with the materials manufacturer or distributor to have the services of a competent field representative at the work site prior to any mixing of components to instruct the work crews in the proper mixing and application procedures. The field representative shall remain at the job site after work commences and continue to instruct until the representative and the Contractor, Inspector and/or Engineer are satisfied that the crew has mastered the technique of installing the system successfully. The representative shall make periodic visits to the project as the work progresses and shall confer on each visit with the Contractor, Inspector and/or Engineer.
2. The manufacturer's field representative must be fully qualified to perform the work and shall be subject to the approval of the Engineer.

METHOD OF MEASUREMENT

Item 481.45 will be measured for payment by the Cubic Foot of elastomeric concrete installed.

BASIS OF PAYMENT

Item 481.45 will be paid for at the Contract unit price per Cubic Foot, which price shall include all labor, materials, equipment, expansion anchors used to secure the elastomeric concrete material to the existing substrate, sawcutting, manufacturer's field representative, and all incidental costs required to complete the work.

Reinforcement placed inside the elastomeric concrete will be paid for under Item 910.1.

Removal and disposal of existing concrete will be paid for separately under item 127.1.

ITEM 740. ENGINEERS FIELD OFFICE AND EQUIPMENT (TYPE A) MONTH

The work under this Item shall conform to the relevant provisions of Subsection 740 of the Standard Specifications and the following:

A computer system and printer system meeting minimum requirements set forth below including installation, maintenance, power, paper, disks, and other supplies shall be provided at the Resident Engineer's Office:

All equipment shall be UL approved and Energy Star compliant.

The Computer System shall meet the following minimum criteria or better:

Processor: Intel, 3.5 GHz

System Memory (RAM): 12 GB

Hard Drive: 500 GB

Optical Drive: DVD-RW/DVD+RW/CD-RW/CD+RW

Graphics Card: 8 GB

Network Adapter: 10/100/1000 Mbit/s

USB Ports: 6 USB 3.0 ports

Keyboard: Generic

Mouse: Optical mouse with scroll, MS-Mouse compliant

Video/Audio the computer system shall be capable of allow video calling and recording:

Video camera shall be High Definition 1080p widescreen capable video calling and recording with built in microphone. The microphone system shall capture natural audio while filtering out background noise.

Audio shall be stereo multimedia speaker system delivering premium sound.

OS: Latest Windows Professional with all security updates

Web Browser: Latest Internet Explorer with all security updates

Applications: Latest MS Office Professional with all security updates

Latest Adobe Acrobat Professional with all security updates

Latest Autodesk AutoCAD LT

Antivirus software with all current security updates maintained through the life of the contract.

Monitors: Two 27" LED with Full HD resolution.
Min. resolution 1920 x 1080

Flash drives: 2 (two) - 128GB USB 3.0

Internet access: High Speed (min. 24 mbps) internet access with wireless router.

ITEM 740. (Continued)

The Multifunction Printer System shall meet the following minimum criteria or better:

Color laser printer, fax, scanner, email and copier all in one with the following minimum capabilities:

- Estimated volume 8,000 pages per month
- LCD touch panel display
- 50 page reversing automatic document feeder
- Reduction/enlargement capability
- Ability to copy and print 11" x 17" paper size
- email and network pc connectivity
- Microsoft and Apple compatibility
- ability to overwrite latent images on hard drive
- 600 x 600 dpi capability
- 30 pages per minute print speed (color),
- 4 Paper Trays Standard (RADF) (not including the bypass tray)
- Automatic duplexing
- Finisher with staple functions
- Standard Ethernet. Print Controller
- Scan documents to PDF, PC and USB
- ability to print with authenticated access protection

The Contractor shall supply a maintenance contract for next day service, and all supplies (toner, staples, paper) necessary to meet estimated monthly usage.

The Engineer's Field Office and the equipment included herein including the computer system, and printer shall remain the property of the Contractor at the completion of the project. Disks, flash drives, and card readers with cards shall become the property of the Department.

Compensation for this work will be made at the contract unit price per month which price includes full compensation for all services and equipment, and incidentals necessary to provide equipment, maintenance, insurance as specified and as directed by the Engineer.

ITEM 853.8**TEMPORARY ILLUMINATION FOR WORK ZONE****DAY**

The work under this Item shall conform to the relevant provisions of Subsection 850 of the Standard Specifications and the following:

The work under this Item shall include furnishing, deploying, and maintaining in proper operating condition a LED balloon diffuser lighting system. These portable light towers shall be used throughout the project area for temporary work zone lighting. The use of unshielded high wattage flood lights shall not be permitted.

These towers shall be used, relocated, and adjusted to meet the criteria in Subsection 850 of the Standard Specifications and the following:

The Contractor shall illuminate the following work zone areas:

- Change in direction (i.e., work zone entrances and exits, crossovers, etc.)
- Tapered areas
- Actual area where the construction is being performed

Light measurement shall be based on the illuminance method and the lighting levels shall be based on the classification of construction activity that is taking place. At no time shall the light level be below 5 fc and the uniformity shall not exceed 6:1. Task Classifications and recommended illumination levels are shown in Table 1.

ITEM 853.8 (Continued)

Task Classifications	Illumination Level	Average Minimum Maintained Illuminance
All work operations areas, setup of lane or road closures, lane closure tapers, and flagging stations such as Excavation (all types), Embankment Fill and Compaction, Reworking Shoulders, Asphalt Pavement Rolling, Subgrade, Stabilization and Construction, Base Course Rolling, Sweeping, Cleaning and Landscaping.	Level I	5 foot-candles
Areas on or around construction equipment, asphalt paving, milling, and concrete placement and/or removal such as Milling, Removal of Pavement, Asphalt Paving and Resurfacing, Concrete Pavement, Waterproofing and Sealing, Sidewalk Construction, Base Course Grading and Shaping, Surface Treatment, Bridge Decks, Drainage Structures and Drainage Piping, Other Concrete Structures, Barrier Wall and Traffic Separators, Guardrails and Fencing, Striping and Pavement Markings, Repair of Concrete Pavement, Highway Signs, Hole Filling and Repair of Guardrails and Fencing.	Level II	10 foot-candles
Pavement or structural crack/ pothole filling, joint repair, pavement patching and/or repairs, installation of signal/electrical/mechanical equipment such as Traffic Signals, Highway Lighting Systems and Crack Filling	Level III	20 foot-candles

TABLE 1
TASK CLASSIFICATIONS AND ILLUMINATION LEVELS

Prior to commencement of work the Contractor shall submit to MassDOT for approval a description of illumination equipment that is proposed to be used on this project and shall include photometrics that detail the light levels that are to be provided for the particular operation for the type of equipment, level of luminance and height to be installed.

Any potential glare from the lighting system should be considered from each direction and on all approaching roadways and opposing lanes of traffic. Glare from the illumination system should be minimized as much as possible for both workers and motorists in adjacent active travel lanes. If necessary, the Contractor shall provide supplemental hardware such as, visors, louvers, shields, glare screen and barrier to reduce glare in adjacent active travel lanes.

ITEM 853.8 (Continued)

Equipment mounted lighting may be used to supplement light towers to achieve the required lighting levels for the activity involved per Table 1.

METHOD OF MEASUREMENT and BASIS OF PAYMENT

Item 853.8 will be measured and paid for at the contract unit price per Day according to Subsections 850.80 and 850.81 of the Standard Specifications. The cost shall include all labor, materials, equipment, tools, and all incidentals required for the design and installation of the work zone lighting system. This shall include, but not be limited to lighting submission preparation, wiring connections, equipment relocations, and include all material and labor incidental for a complete, functional, and operational work zone illumination system.

The price of this item shall include the material and labor necessary to install any supplemental hardware required to reduce glare on all adjacent active travel lanes.

The per Day (up to 24 hours) price shall be full compensation for all “Temporary Illumination for Work Zone” regardless of the number of concurrent work areas, amount of equipment concurrently in use or the durations of or changes of the work shifts per Day.

Furnishing, installing, resetting, modifying, and removing equipment for work zone illumination shall be incidental to Item 853.8.

ITEM 854.6**TEMPORARY PORTABLE RUMBLE STRIP****DAY**

The work under this Item shall conform to the relevant provisions of Subsection 850 of the Standard Specifications and the following:

Work under this item consists of furnishing, deploying, maintaining in proper operating conditions, and removing temporary portable rumble strips (TPRS) for temporary lane closures of 24 hours or less.

MATERIALS

The TPRS shall be 10' to 11' wide, measured perpendicular to the path of travel, 12" to 16" long, measured parallel to the path of travel, and 0.5" to 0.75" tall. All edges shall be beveled. The surfaces shall be grooved to limit potential hydroplaning.

The TPRS shall lay flat on the road surface without the use of nails, anchors, or adhesives, and shall be flexible so as to conform to the surface profile.

The TPRS shall be able to withstand vehicle weights of up to 80,000 lbs. and operate in temperatures between 0° to 120° F.

The manufacturer shall certify the TPRS to be safe for use on roads with speed limits of at least 70 mph.

TPRS that appear damaged or functioning in an unsafe manner may be ordered removed by the Engineer and replaced at no additional cost.

CONSTRUCTION METHODS

The TPRS shall be installed per the plans or at the discretion of the Engineer.

The Contractor shall conform to the manufacturer's specifications for installation and the following:

- A. The road surface shall be cleared of all gravel, sand, and debris.
- B. If RoadQuake 2™ model is used, the modular pieces shall be assembled into 11-foot strips per the manufacturer's instructions in advance of deployment. The interconnected segments shall form a smooth and flat, continuous section.
- C. A Truck-Mounted Attenuator, conforming to Section 850, shall be used as shadow vehicle protection during the deployment and removal of TPRS on any roadway with speeds of 45 mph or greater.
- D. TPRS shall be deployed in conjunction with all other temporary traffic control devices. MA-W28-1 (Rumble Strips Ahead) sign(s) shall be installed per the Temporary Traffic Control Plan.

ITEM 854.6 (Continued)

E. TPRS deployment:

1. TPRS shall be placed perpendicular to the direction of travel, centered in the lane.
2. Three (3) individual strips are required for a single array.
3. Refer to the Temporary Traffic Control Plan for the location of the array respective to the lane closure.
4. The spacing of the individual strips within the array shall conform to the following table:

Speed Limit	Distance Between Rumble Strips (measured center-to-center)
>55 mph	20 feet
40 mph to 55 mph	15 feet
<40 mph	10 feet

5. The TPRS shall be placed without the use of nails, adhesives, or other methods of affixing them to the road surface.
- F. All TPRS shall be maintained in proper condition, alignment, spacing, and location throughout the duration of the lane closure, at no additional cost.
- G. The TPRS shall be removed prior to the removal of the traffic control devices used to close the travel lane.
- H. TPRS shall not be used during snow events.

METHOD OF MEASUREMENT

An array of three (3) temporary portable rumble strips is considered one (1) unit and will be measured by the Day. Each period of up to 24 hours during which this unit is in use will be measured as one day regardless of the number of times the array is deployed, repositioned, or removed.

BASIS OF PAYMENT

Temporary Portable Rumble Strips will be paid for at the contract unit price per Day, which shall include full compensation for furnishing, deploying, repositioning, and removing the array of three (3) individual strips as directed by the Engineer.

ITEM 859.1**REFLECTORIZED DRUMS
WITH SEQUENTIAL FLASHING WARNING LIGHTS****DAY**

The work under this Item shall conform the relevant provisions of Subsection 850 of the Standard Specifications and the following:

The work under this item consists of furnishing, installing, maintaining in proper operating conditions, and removing reflectorized drums, and any necessary ballast, equipped with sequential flashing warning lights.

Materials

Reflectorized drums shall be listed on the MassDOT Qualified Traffic Control Equipment List. Reflective sheeting on drums shall meet or exceed ASTM D4956 Type VIII. All drums shall be maintained in a satisfactory manner including the removal of oils, dirt, and debris that may cause reduced retro reflectivity.

The Contractor shall use one of the following sequential flashing warning light systems unless otherwise approved by the Engineer:

- Empco-Lite LWCS.
- pi-Lit® Sequential Barricade-Style Lamp; or
- Unipart Dorman SynchroGUIDE.

Sequential flashing warning lights shall be secured to reflectorized drums per the light manufacturer's specifications.

Construction Methods

The first ten drums in any merging or shifting taper shall be equipped with sequential flashing warning lights. These lights shall be operating, at a minimum, between dusk and dawn when the taper is deployed.

The successive flashing of the sequential warning lights shall occur from the upstream end of the merging or shifting taper to the downstream end of the taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55, nor more than 75 times per minute. Warning lights shall be powered off when drums are not deployed in a taper.

METHOD OF MEASUREMENT

A group of ten (10) reflectorized drums with sequential flashing warning lights is considered one (1) unit and will be measured by the Day. Each period of up to 24 hours during which this unit is in use will be measured as one day regardless of the number of times that the drums are positioned, repositioned, removed, or returned to service.

BASIS OF PAYMENT

Reflectorized Drums with Sequential Flashing Warning Lights will be paid for at the Contract unit price per Day, which shall include full compensation for furnishing, positioning, repositioning, and removing the group of ten (10) drums as directed by the Engineer.

ITEM 868.06
ITEM 869.06**6 INCH REFLECTORIZED WHITE LINE (EPOXY)**
6 INCH REFLECTORIZED YELLOW LINE (EPOXY)**FOOT**
FOOT

The work to be done under Items 868.06 and 869.06 shall conform to the relevant provisions of Subsection 860 of the Standard Specifications and the following:

Work under these items shall consist of the furnishing and installation of regular-dry white and lead-free yellow EPOXY reflectorized pavement markings (including edge lines, skip lines, gore lines).

As work incidental to these items the Contractor or epoxy material supplier shall measure the performance of the pavement markings upon installation according to the measurement and sampling procedures outlined in ASTM D6359 using a new hand-held 30 meter retroflectometer.

MATERIALS

For epoxy applications, the Contractor shall use one of the following products, or approved equivalent:

- Ennis Flint HPS-3,
- Epoplex LS-70,
- Swarco 1180 series

CONSTRUCTION METHODS

All work shall be done in accordance with the material suppliers specifications and the following:

During marking operations, the pavement surface where the epoxy is to be placed shall have a minimum temperature of 40° F and the air temperature shall be at least 35° F.

The pavement surface on which the epoxy paint material is placed shall be clean and dry. Existing traffic markings shall be removed by blasting or grinding. The curing compound on Portland cement concrete shall also be removed. Existing markings shall be removed so that at least 95% of the underlying pavement is visible. The abrasive material shall be removed from the pavement surface before the pavement is opened to uncontrolled traffic flow.

The epoxy paint markings shall have a thickness of 25 mils \pm 1 mil, calculated without drop-on glass beads. All markings shall have uniform thickness with a uniform distribution of glass beads throughout the line width. The width of lines shall be as specified with a tolerance of 0.25 inches. Markings shall have sharp edges and cutoff at the ends.

Glass beads shall be applied as a reflective medium, using the double drop method, at a rate in accordance with the epoxy manufacturer's specification.

ITEMS 868.06, and 869.06 (Continued)

METHOD OF MEASUREMENT

Item 868.06 and Item 869.06 will be measured for payment by the Foot, complete in place. Measurements will be per Subsection 860, section. 860.80, Method of Measurement.

BASIS OF PAYMENT

Item 868.06 and Item 869.06 will be paid for at the respective Contract unit prices per Foot, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

ITEM 905. **4000 PSI, 3/8 INCH, 660 CEMENT CONCRETE** **CUBIC YARD**

The Work under this Item shall conform to the relevant provisions of Subsection 901 of the Standard Specifications and the following:

The work under this Item shall consist of furnishing and placing 4000 PSI, 3/8 INCH, 660 Cement Concrete. This item shall be used for patching after all deteriorated and/or unsound concrete is removed under Item 127.12. The Contractor's attention is also directed towards the Repair Procedure Notes and Details contained in Document A00803.

The Engineer shall determine whether to use this Item or to direct the use of a Hi-Early mix. All cost(s) associated with the addition of any approved admixture to the cement concrete shall be considered incidental to this Item.

Approval by the Engineer of all formwork shall be required prior to placement of any concrete.

All formwork placed under this item must be removed no later than forty-five (45) days after the repair is completed. Failure to remove the formwork within forty-five (45) days may result in its removal by others, with the associated costs being assessed to the Contractor.

PREPARATION OF CONCRETE SURFACES:

All concrete surfaces to be patched shall be roughened, cleaned of all laitance, dirt, grease, oil, other contaminants and all standing water. All reinforcing steel encountered in the excavation shall be thoroughly cleaned by abrasive blasting and coated with a zinc-rich primer conforming to MassDOT Standard Specification M7.04.11 before being covered with new concrete.

The excavated areas shall then be coated with an Epoxy Bonding Compound. At the discretion of the Engineer, epoxy bonding compound may be omitted in favor of a thorough application of water for a minimum of 10 minutes. Any remaining water should be blown out to produce a saturated surface dry (SSD) condition using oil free compressed air.

METHOD OF MEASUREMENT and BASIS OF PAYMENT

Item 905. will be measured and paid per Subsections 901.80 and 901.81, respectively.

The use of High-Early strength concrete when directed by the Engineer, shall be incidental to this Item.

ITEM 909.3**RAPID SETTING LOW PERMEABILITY
CONCRETE****CUBIC YARD**

The Work under this Item shall conform to the relevant provisions of Subsection 901 of the Standard Specifications and the following:

The work under this Item shall consist of the supplying, mixing, placing, and curing of rapid setting low permeability repair concrete for deck repairs.

Materials shall be delivered to jobsite in original, unopened, undamaged containers that clearly show the manufacturer's name, product name, and batch number. Material shall be stored in a dry area off the ground, protected from rain, snow, and other sources of moisture. Material shall be protected from temperature extremes. Bulk sand and coarse aggregate shall be stored in a well-drained area on a clean, solid surface and materials shall be covered to prevent contamination with foreign matter.

MATERIALS

The rapid setting low permeability concrete deck repair material shall comply with the following material and proportioning requirements:

Component	Value
Cement Content	559 Pounds Per Cubic Yard
Fly Ash – Class F (AASHTO M 295)	99 Pounds Per Cubic Yard
Coarse Aggregate 3/8" (AASHTO M 80)	1450 Pounds Per Cubic Yard
Fine Aggregate (ASTM C33)	1600 Pounds Per Cubic Yard
Retarder*	As Directed
Water (AASHTO T 26)	296 Pounds Per Cubic Yard

* An approved retarding admixture may be used to extend the setting time of the concrete when so directed by the Engineer at dosage rates recommended by the cement concrete deck repair material manufacturer. Retarding admixture proposed for use must be approved by the Engineer. Only Materials listed on the MassDOT Qualified Construction Materials List (QCML) may be used.

Modifications to the cement concrete mix design provided above must be submitted to the Engineer for approval. The cement concrete must satisfy all performance criteria and trial batch testing requirements to the satisfaction of the Engineer to be considered acceptable.

Acceptance of the concrete compressive strength will be based on the field cured cylinders achieving a minimum of 5000 psi at 7 days or earlier as cast and tested by MassDOT. Compressive strength testing of field cured cylinders cast and tested by MassDOT should achieve a minimum compressive strength of 4000 psi at 30 hours as a verification that the mix is on target to achieve the 7-day acceptance requirement.

ITEM 909.3 (Continued)**SURFACE PREPARATION**

Existing concrete surfaces to be in contact with the proposed deck repair concrete must be free of materials such as paint, oil, curing compound, bond breaker, etc., that will inhibit bonding. Existing concrete surfaces shall be hydroblasted with equipment that can remove asphaltic material, oils, dirt, rubber, curing compounds, paint carbonation, laitance, weak surface mortar, and other potentially detrimental materials, which may interfere with the bonding or curing of the proposed deck repair and overlayment concrete.

Retained reinforcing steel shall be cleaned by abrasive blasting or other mechanical means to achieve a white metal finish and coated with zinc reach primer conforming to MassDOT Spec M7.02. Deteriorated reinforcement shall be replaced as directed by the Engineer.

Existing concrete surfaces must be saturated prior to concrete placement using potable water. Standing water shall be removed from surfaces to achieve a Saturated Surface Dry (SSD) condition.

MIXING

Cement concrete mixes shall be batched using Mobile Concrete (volumetric) mixing equipment. The MassDOT Highway Division will only permit the use of Mobile Concrete Mixers when all the following procedures are adhered to.

Upon written request by a Contractor, the Deputy Chief Engineer for Construction may approve the use of concrete proportioned by a Mobile Concrete Mixer used for the purpose of mixing rapid setting low permeability deck repair concrete.

All cement concrete materials, concrete handling, placement, protection, curing, and finishing requirements of the *Standard Specifications for Highways and Bridges* shall apply. Mobile Concrete Mixers shall meet all the requirements of ASTM C685 and be currently registered with the Volumetric Mixer Manufacturers Bureau (VMMB).

Each Mobile Concrete Mixer used on MassDOT Highway Division projects shall be pre-qualified as follows: All Mobile Concrete Mixers are required to have a Quality System Manual (QSM) that conforms to the format outlined in AASHTO R-38 and that adequately addresses the information specified in AASHTO R-38. The QSM shall be approved by the Research & Materials Section annually. A copy of the approved QSM shall be kept with the Mobile Concrete Mixer and made available to the Engineer upon request. The Quality Control procedures for concrete production contained in the approved QSM shall be adhered to for all placements.

ITEM 909.3 (Continued)

The concrete mixing and delivery equipment shall be capable of mixing and delivering concrete to the placement location at rates that are sufficient to comply with the project's restrictive time constraints. Cement concrete shall be proportioned and mixed using self-contained, mobile, and continuously mixing equipment that meets the following requirements:

1. Use a self-propelled mixer that is capable of carrying sufficient unmixed, dry, bulk cement, sand, coarse aggregate, and water to produce at least 6 cubic yards of concrete on site.
2. Use a mixer that is capable of positive measurement of cement introduced into the mix as well as fine and coarse aggregate. Use a recording meter that is visible at all times and equipped with a ticket printout to indicate the quantity of cement and aggregate materials.
3. Calibrate the mixers to accurately proportion the specified mix. Prior to placing concrete, perform calibration and yield tests under the Engineer's supervision and in accordance with the Department's written instructions. Copies of these written instructions are available from the Research & Materials Section. Perform the calibration and yield tests using the material to be used on the project. Recalibrate the mixer after any major maintenance operation on the mixer, anytime the source of materials changes, or as directed. Furnish all materials and equipment necessary to perform the calibrations and yield tests.
4. Use a mixer that controls the flow of water into the mix. Measure the flow rate of water with a calibrated flow meter coordinated with both the cement and aggregate feeding mechanisms and the mixer. Adjust the flow rate, as necessary, to control the slump and ensure that the water-cement ratios are met. In addition to flow meters, use mixers with accumulative water meters capable of indicating the number of gallons, to the nearest 0.1 gallon, introduced into the mixer. Filter water with a suitable mesh filter before it flows through the accumulative water meters.
5. Use a mixer that has a minimum of two liquid admixture dispensers and is capable of dispensing the admixtures through a controlled flow meter in accordance with ASTM C685.
6. Calibrate the mixer to automatically proportion and blend all components of the indicated composition on a continuous or intermittent basis as the finishing operation requires. Provide a mixer that discharges mixed material through a conventional chute and is capable of spraying water over the placement width as it moves ahead to ensure that the surface to be overlaid is wet prior to receiving the concrete.
7. Mount a tachometer on the unit to indicate the drive shaft speed.

ITEM 909.3 (Continued)Mix Design Requirements

Performance Criteria	
ASTM C191 Set Time (Mod)	
Initial Set	30 minutes
Final Set	40 minutes
Slump of Concrete	
7 to 9 inches	
Air Content	
3% to 7%	
Compressive Strength	
4 hours	2500 psi Minimum
7 days	5000 psi Minimum
Bond Strength (ASTM C882)	
24 hours	1200 psi Minimum
7 days	1900 psi Minimum
28 days	2200 psi Minimum
Chloride Penetration (ASTM C1202)	
90 days	1500 Coulomb Maximum
Shrinkage (ASTM C157)	
28 days	0.04% Maximum
Freeze – Thaw Durability (ASTM C666)	
300 cycles (Durability Factor)	80 Minimum
Unit Weight	150 pcf

The concrete mix design shall be mitigated per Subsection M4.02.00. Proposed mix design with data sheets and trial batches shall be submitted to the Research and Materials Section for review and approval. The Engineer shall be notified at least 48 hours prior to the test batching and shall be present to witness the testing.

All tests necessary to demonstrate the adequacy of the concrete mix shall be performed by the Contractor, including but not limited to: slump, air content, temperature, initial set and final set (AASHTO T197). Compressive strength tests shall be determined on field cured cylinders (6" X 12" cylinders) (a minimum of 9 sets of 2 cylinders=18 total) at 3 hours, 4 hours, 5 hours, 6 hours, 24 hours, approximately 30 hours, 2 days, 3 days, and standard cured cylinders at 7 days, and additional cylinders as needed.

Compressive strength results of Standard and Field cured trial batch cylinders shall meet all the following minimum overdesign strength requirements in order to be considered acceptable. Compressive strength results shall be the average of two (2) 6" x 12" cylinders:

4 hour cylinders: 3,000 psi
 30 hour cylinders: 5,000 psi
 7 day cylinders: 6,000 psi

ITEM 909.3 (Continued)

Research & Materials Section personnel will witness calibration or verification of equipment and prequalification sampling and testing of concrete ingredients performed for each Mobile Concrete Mixer. Concrete mix design and trial batches shall be preapproved by the Research & Materials Section.

For any project where a Mobile Concrete Mixer is proposed to be used, the Contractor must prepare and submit a project-specific construction Quality Control Plan (QC Plan). The QC Plan shall conform to the format and content detailed in the Northeast Transportation Training and Certification Program (NETTCP) Model QC Plan (December 2009, or latest edition).

Information contained in relevant sections of the approved QSM for the proposed Mobile Concrete Mixer may be referenced, rather than repeated, in applicable sections of the QC Plan (e.g., Materials Control, Production Facilities). The QC Plan shall be submitted to the Engineer a minimum of 30 days prior to proposed placement of concrete by Mobile Concrete Mixer. The District Construction Engineer and the Research & Materials Section will review the QC Plan. The Contractor shall not place any concrete by Mobile Concrete Mixer prior to approval by the Research & Materials Section.

A signed batch ticket printout from the printer mounted on the Mobile Concrete Mixer truck indicating that the mix batched is in conformance with the mix design previously approved shall also be provided to the Engineer prior to discharging concrete. The batch ticket shall record the actual water/cement ratio.

Quality Control inspection, sampling and testing, including but not limited to slump, air content, temperature and cylinders for compressive strength, shall be performed by the Contractor in accordance with the approved QC Plan. The Engineer will perform Acceptance sampling (every 50 cubic yards per day per approved truck) and testing for field cured cylinders as well as Acceptance inspection for materials and workmanship attributes.

The use of Item 909.3 is prohibited when the ambient temperature is expected to drop below 40° F within 7 days prior to the anticipated concrete placement. The Engineer may suspend or revoke approval of the Mobile Concrete Mixer at any time the unit fails to produce uniformly mixed concrete within the quality limits specified.

Material to be mixed should have a temperature of about 70°F. Warmer material will set faster than expected and cooler material will have slower strength gain. The temperature of the mixed concrete shall be controlled by protecting the bags of repair material from temperature extremes and by adjusting the temperature of the mixing water.

The coarse aggregate shall be placed in the mixer followed by the mixing water, then the cement. The components shall then be mixed for 2 to 3 minutes to achieve a uniform lump-free consistency.

ITEM 909.3 (Continued)

Admixtures not included as part of the approved mix design shall not be added without the approval of the Engineer. The repair concrete shall not be re-tempered. The concrete mixing and delivery equipment shall be capable of mixing and delivering concrete to the placement location at rates that are sufficient to avoid horizontal cold joints between successive placements.

PLACEMENT AND FINISHING

The deck repair concrete shall be placed onto substrates that are Saturated, Surface Dry (SSD). The manufacturer's limitations on minimum surface and ambient temperatures shall be complied with.

Surfaces that are adjacent to the placement shall be protected with drop cloths, waterproof paper, or other means to maintain them free of material splashes, water, and debris.

The deck repair concrete shall be placed immediately after mixing and shall be worked firmly into sides and bottom of repair area to achieve good bond. The concrete placement shall start at one edge of the excavation and shall continue full depth with temporary vertical bulkheads, if needed, to ensure that horizontal cold joints do not occur between successive concrete placements.

Final finishing shall be performed as soon as possible after placement as there will be little or no bleed water.

BRIDGE DECK VIBRATION

At the direction of the Engineer, in order to minimize the effects of vibrations from vehicular traffic passing in adjacent lanes next to each placement, traffic should be slowed along the adjacent travel lanes and the placement of concrete overlay should be executed between the hours of lower traffic volumes, generally between 1:00 AM and 3:00 AM.

CURING

Water curing of the deck repair concrete shall start once the deck repair concrete begins to lose its moist sheen. Wet burlap shall be placed on the deck repair concrete and the burlap shall be kept continuously wet for a 3 hours period after final set. Application of an approved curing compound in lieu of the 3 hours wet burlap cure must be reviewed and approved by the Engineer.

CLEAN UP

The mixer shall be cleaned immediately after use or add mix water and begin mixing immediately for the next batch. Buildup of hardened repair material in the mixer shall not be allowed since this creates inefficient mixing and the heat generated accelerates later batches.

ITEM 909.3 (Continued)**METHOD OF MEASUREMENT**

Item 909.3 will be measured for payment by the Cubic Yard of concrete actually finished and installed complete in place.

BASIS OF PAYMENT

Item 909.3 will be paid for at the Contract unit price per Cubic Yard, complete in place, which price shall include all labor, materials, tools, forms, field representative, equipment and all incidental costs required for providing, placing and complete the work of the Rapid Setting Low Permeability Repair Concrete as described and as required by the Engineer.

Payment for the excavation, removal, and satisfactory disposal of all reinforced concrete for the repairs shall be made as described in Items 127.1 and 127.41.

Payment for replacing and installing new reinforcing steel shall be made, if required, under Item 910.1, Steel Reinforcement for Structures - Epoxy Coated.

ITEM 964.3**ELASTOMERIC PROTECTIVE COATING****SQUARE FOOT**

The work to be done under this Item shall consist of applying a minimum of two coats of an elastomeric acrylic protective coating to bridge copings and the above grade surfaces of the substructure components and other locations as directed by the Engineer.

A total dry film thickness (DFT) of 16 mils shall be required.

The acrylic protective coating shall be breathable, durable, flexible, and color retentive. It shall provide protection and be resistant to weathering, carbon dioxide, chlorides, UV light, wind driven rain, dirt pick up and mildew. It shall also bridge hairline cracks up to 1/32". The acrylic protective coating system shall be one of the following or an approved equal:

- SikaGard 550W Elastocolor by Sika Corp.
- Flexxide Elastomer by Carboline
- Colorlastic by ChemMasters

The proposed coating product shall be submitted to the Engineer for approval. The Contractor shall submit the proposed application procedures and Manufacturer's Product Data Sheet(s) that completely describe the product. The color of the coating shall "Gray" for the substructure. This color is from the SikaGard Color Chart and has been approved by the District Bridge Engineer. This color must be exactly reproduced as certified by the manufacturer in order to be allowed to use the Flexxide or Colorlastic coatings (at this time Flexxide has matching color samples that have been pre-approved).

Preparation and Protection of Surfaces

All vegetation growing adjacent to or within the limits of the concrete surfaces to be coated shall be removed and properly discarded. All debris adjacent to or within the limits of the concrete surfaces to be coated shall be removed and properly discarded.

All surfaces to be coated must be dry, clean, sound, and free of all contaminants that could interfere with adhesion of the coating. All loose material shall be removed. If directed by the Engineer, the contractor shall repair any holes and any spalled and damaged concrete prior to applying the coating. All concrete repair areas shall be cured for a minimum 28 days before coating.

The Contractor shall pressure wash all concrete surfaces to be coated. The pressure washer shall operate at a minimum of 3,000 psi. The protective coating shall not be applied until the surface is dry and the surface preparation has been approved by the Engineer. All concrete to be coated must be tested for the presence of moisture after the surface preparation has been completed and prior to application of coating. Testing shall be in accordance with ASTM D 4263.

ITEM 964.3 (Continued)**Application**

Application shall be done by airless sprayer or roller or a combination of both and in accordance with the manufacturer's recommendations. The use of a primer shall not be required unless stipulated for that particular coating by the manufacturer. A minimum of two coats shall be applied to achieve a total DFT of 16 mils. The recommended minimum wet film thickness (WFT) must be maintained during each application. The manufacturer's specified temperature and weather limitations for the application shall be strictly adhered to.

METHOD OF MEASUREMENT

Item 964.3 will be measured for payment by the Square Foot of the are where elastomeric protective coating is applied.

BASIS OF PAYMENT

Item 964.3 will be paid for at the Contract unit price per Square Foot, which price shall include all labor, materials, equipment, preparation and protection of surfaces, and all incidental costs required to complete the work.

ITEM 964.6**PENETRATING EPOXY SEALER
TREATMENT ON BRIDGE DECKS****SQUARE YARD**

The work to be done under this Item shall consist of providing all labor, materials, and equipment required to prepare, clean, and apply a penetrating epoxy sealer system with sand aggregate to entire surface of exposed concrete bridge deck of Bridges No. B-16-053 (4T3), Brookline Ave over I-90 & Railroad. The limits shall be from curb to curb and from the bridge side of the plug joint at the south abutment to the bridge side of the plug joint at the north abutment, excluding the elastomeric concrete and joint seals at piers 1 and 2.

Materials

The epoxy sealer system shall be one of the following or approved equivalent:

- Bridge Seal 75% by Unitex
- Dural 335 by Euclid Chemical
- Sikadur 55 SLV by Sika Corporation

The sealer system shall be selected with cure time in mind and in consideration to the overall deck sealing operation schedule. Sealer system that requires long cure time and works to impact the project's requirement that all lanes are re-opened to traffic during daily high volume hours will be rejected by the Engineer.

The sand aggregate used in conjunction with the epoxy system shall meet the requirements of Sand Borrow, M1.04.0 of the 1988 Standard Specifications and April 1, 2019 Supplemental Specifications, and be poorly graded with grain size between U.S. sieve size 20 and 40. The aggregate must be angular, with less than 0.2 percent moisture, and free of dirt, clay, asphalt, and other foreign or organic materials.

Equipment

For the epoxy sealer, the mixing and application systems must be capable of accurately blending the epoxy resin and hardening agent and must uniformly and accurately apply the epoxy materials at the specified rate to the bridge deck in such a manner as to cover 100 percent of the work area including 1 inch of the vertical face of the curb/barrier.

The fine aggregate spreader must be propelled in such a manner as to uniformly and accurately apply dry aggregate to excess onto the applied epoxy material. Self-propelled vacuum truck shall be used to remove excess debris and aggregate. For hand applications, equipment must consist of calibrated containers, a paddle type mixer, squeegees, and stiff bristle brooms suitable for mixing and applying the epoxy and aggregate.

ITEM 964.6 (Continued)**Submittal**

The Contractor shall submit for review and approval by the Engineer the Bridge Deck Penetrating Epoxy Sealer Installation Plan, which shall include but not be limited to the following:

1. Material list and corresponding cut sheets
2. Equipment list and corresponding cut sheets (for surface preparation, epoxy mixing, and aggregate boarding)
3. A copy of International Concrete Repair Institute Guideline No. 03732
4. Application procedure
5. Method to protect bridge joint, and areas not to be sealed
6. Work schedule (Including curing time for epoxy)

The Contractor shall not begin the work until written approval of the above submittals has been received from the Engineer.

Construction.**Surface Preparation**

Inspect the deck and identify deteriorated concrete areas for full and/or partial depth concrete deck repair. All concrete deck patches shall be cured for at least 28 days of age prior to the shotblast cleaning operation.

The Contractor shall remove all existing pavement marking on the bridge deck area for the sealer application. This work shall be considered incidental to the Item.

The Contractor shall remove all sand deposit, and other debris from the bridge. Immediately prior to application of the sealer, clean the entire deck surface by shot blasting to remove asphaltic material, oils, dirt, rubber curing compounds, paint carbonation, laitance, weak surface mortar, and other materials that may interfere with the bonding or curing of the sealer. The prepared deck surface must conform to requirements described in the International Concrete Repair Institute Guideline No. 03732, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays, concrete surface profile 3 (CSP 3). The Pavement markings on the bridge deck must be removed and replaced at the completion of the work. A vacuum cleaner or oil-free moisture-free air blast should be used to remove all dust and other loose material.

Patching and cleaning operations must be inspected and approved prior to placing the sealer. Any contamination of the deck, or to intermediate courses, after initial cleaning, must be removed.

ITEM 964.6 (Continued)

There must be no visible moisture present on the surface of the concrete at the time the epoxy sealer is applied. Conduct moisture testing in accordance with ASTM D 4263. A transparent polyethylene sheet (4 mil) must be taped to the deck. Seal all edges with tape that will stick to the concrete substrate and leave the plastic sheet in place for a minimum of 16 hours to detect the presence of moisture in the deck concrete. There must be no moisture visible on the polyethylene sheet. Alternate methods to detect moisture must be approved by the Engineer. Compressed air may be used to dry the deck surface, providing it is moisture and oil free.

The bridge joints, drainage structures, and any other areas not to be sealed, shall be protected from damage during preparation of the surface. The protection shall be removed once the epoxy and aggregate has been applied, but prior to initial set of the epoxy. The protection must meet the approval of the Engineer.

Application

The epoxy manufacturer's representative must be on site prior to and during the installation to ensure all preparation and application is performed according to their requirements. The epoxy sealer shall be applied and spread according to the manufacturer's recommendations. The fine aggregate shall be applied in such a manner as to cover the epoxy mixture completely within 5 minutes. The epoxy sealer system shall be applied to the entire bridge deck surface and the areas within 1 inch of the vertical face of the curb/barrier.

The fine aggregate (sand) must be applied to excess and provide a dry appearance to the deck after placement. No bleed through, or wet spots should be visible in the overlay. If the surface appears wet additional sand will need to be placed immediately. The sand should be spread at a rate of at least 1.5 pounds per square foot. The Contractor should use an air compressor connected to a venturi system to effectively broadcast the aggregate.

All foot traffic on the uncured epoxy shall be minimized and shall only be done with steel spiked shoes approved by the Engineer.

The minimum curing periods must be according to the manufacturer's recommendations, or as directed by the Engineer. The epoxy sealer shall also be cured until loose aggregate can be removed by vacuuming or brooming without tearing or damaging the surface. No traffic or equipment is allowed on the deck surface during the curing period.

The Contractor shall plan and prosecute the work to provide the minimum curing periods for both courses as specified herein, or other longer minimum curing periods as recommended by the manufacturer, prior to opening the bridge to traffic, unless otherwise permitted. Remove and replace any areas damaged or marred by the Contractor's operations in accordance with this special provision at no additional cost to the Department.

Provide the Engineer with all records including, but not limited to, the following for each batch provided:

ITEM 964.6 (Continued)

- batch numbers and sizes
- location of batches as placed on deck, referenced by stations
- batch time
- temperature of air, deck surface, epoxy components, including aggregates
- loose aggregate removal time
- time open to traffic

The work shall be scheduled to be performed when the ambient temperature is expected to be not less than 73 and not greater than 95 degrees Fahrenheit.

Manufacturer's Field Representative

1. The Contractor shall arrange with the epoxy system's manufacturer or distributor to have the services of a competent field representative at the work site prior to any installation to instruct the work crews in the proper installation procedures. The field representative shall remain at the job site after work commences and continue to instruct until the representative and the Contractor, Inspector and/or Engineer are satisfied that the crew has mastered the technique of installing the system successfully. The representative shall make periodic visits to the project as the work progresses and shall confer on each visit with the Contractor, Inspector and/or Engineer.
2. The manufacturer's field representative must be fully qualified to perform the work and shall be subject to the approval of the Engineer.

METHOD OF MEASUREMENT

Item 964.6 will be measured for payment by actual Square Yard of penetrating epoxy sealer system installed on the bridge deck.

BASIS OF PAYMENT

Item 964.6 will be paid for at the Contract unit price per Square Yard, which price shall include full compensation for all material, labor, equipment, and incidental work required for cleaning, preparing and applying a penetrating epoxy sealer system. The removal of the pavement markings from the bridge deck, the manufacturer's field support, and miscellaneous clean-up shall be considered incidental to this item.

The Contractor shall be completely responsible for the expense of the service of the required field representative and the bid contract price shall be full compensation for all costs in connection therewith.

The partial depth concrete deck repair shall be performed and paid for under corresponding Item 127.41.

ITEM 968.5**BRIDGE DRAINAGE SYSTEM REPAIRS****LUMP SUM**

The work to be done under this Item shall consist of repairing the bridge drainage system. The repairs, including shop drawings, shall be designed by the Contractor, stamped by a Massachusetts registered professional engineer and approved by the Engineer.

The south abutment has a trough along the back of the bridge seat and four steel scuppers that are heavily corroded. The west most and east most scuppers are completely corroded through.

Repairs shall include but are not limited to the scuppers with advanced section loss and the south abutment trough. Prior to preparing repair drawings the limits of repairs shall be field verified by the contractor.

BASIS OF PAYMENT

Item 968.5 will be paid for at the Contract unit price Lump Sum, which price shall include all labor, materials, equipment, design/engineering services for drainage repairs, shop drawing submittals, and all incidental costs required to complete the work.

ITEM 973.1**PRE - COMPRESSED JOINT SEAL SYSTEM****FOOT**

The work to be done under this Item shall conform to the relevant provisions of Subsections 971 and 972 of the Supplemental Specifications, and the following:

The work to be performed under Item 973.1 shall consist of furnishing and installing a continuous pre-compressed seal joint through the roadway, sidewalks, curbs, medians, and parapets at bridge locations specified by the Engineer. The pre-compressed joint sealer shall be installed as shown on the enclosed Detail Drawings and these Special Provisions.

The pre-compressed seal joint system assembly shall consist of a preformed (pre-compressed) seal, epoxy adhesive, and injected silicone sealant bands all combined in a manner required by the Contract Document.

MATERIAL

The material of the pre-compressed seal joint system shall be capable of accommodating movements of +50%, -50% (100% Total) of nominal material size.

The pre-compressed seal joint system shall be as manufactured by EMSEAL JOINT SYSTEMS LTD (BEJS), Watson Bowman Acme (Wabo®FS), Schul International Co. (Sealtite 50N), or approved equivalent.

The joint system shall be comprised of three components: 1) cellular polyurethane foam impregnated with hydrophobic 100% acrylic (to be certified in writing by independent laboratory tested FTIR and DSC analysis to be free in composition of any waxes or wax compounds), water based emulsion, factory coated with highway-grade, fuel resistant silicone; 2) field-applied epoxy adhesive primer; 3) field-injected silicone sealant bands. Impregnation agent is to have proven non-migratory characteristics. Silicone coating to be highway-grade, low-modulus, fuel resistant silicone applied to the impregnated foam sealant at a width greater than maximum allowable joint extension and which when cured and compressed will form a bellow. Depth of seal shall be as recommended by manufacturer. The foam seal shall be installed into manufacturer's standard field-applied epoxy adhesive. The sealant system is to be installed recessed from the surface such that when the field applied injection band of silicone is installed between the substrates and the foam-and-silicone-bellow, the highest part of the silicone bellow will be flush with the concrete deck surface.

Changes in plane and direction shall be executed using factory-fabricated "universal 90" or custom transition assemblies supplied by the manufacturer of the pre-compressed seal. Transitions shall be warranted to be watertight at inside and outside corners through the full movement capabilities of the product.

CONSTRUCTION METHOD

The new deck concrete, including elastomeric headers, must be cured and reach its design compressive strength prior to the installation. The Contractor shall produce uniform and parallel surfaces in the forming within the reinforced concrete deck slabs as detailed on the plans. The joint opening shall be protected by the Contractor to prevent any edge damage by any site equipment throughout the on-going construction process.

ITEM 973.1 (Continued)

Prior to installation of the joint system, the joint opening should be blown clean using oil-free compressed air. The compressed air shall be free of moisture and oil. To insure cleanliness, the joint walls shall be wiped clean with a clean wet cloth to the depth of the bottom of the pre-compressed seal material plus 1" to remove any dust remaining. The joint gap shall be inspected for cleanliness by the Engineer. Should any contaminants remain, the joint must be re-cleaned.

The pre-compressed seal, epoxy adhesive, and injected silicone sealant band shall be installed in accordance with the Contract's drawings. The pre-compressed seal joint system shall be continuous through sidewalks, curbs, medians, and parapets as appropriate to the conditions at hand. Continuity of seal shall be achieved through the use of factory-fabricated universal or custom transitions supplied by the pre-compressed joint seal manufacturer.

MANUFACTURER'S FIELD REPRESENTATIVE

1. The Contractor shall arrange with the pre-compressed seal joint system's manufacturer or distributor to have the services of a competent field representative at the work site prior to any installation to instruct the work crews in the proper installation procedures. The field representative shall remain at the job site after work commences and continue to instruct until the representative and the Contractor, Inspector and/or Engineer are satisfied that the crew has mastered the technique of installing the system successfully. The representative shall make periodic visits to the project as the work progresses and shall confer on each visit with the Contractor, Inspector and/or Engineer.
2. The manufacturer's field representative must be fully qualified to perform the work and shall be subject to the approval of the Engineer.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 973.1 will be measured and paid at the Contract unit price per Foot, as measured along the joint centerline at the roadway, safety curb, sidewalk, parapet, and median. The Contract price shall include all labor, material, equipment, manufacturer's representative, and all incidental costs required to complete the work as described and as required by the Engineer.

The Contractor shall be completely responsible for the expense of the service of the required field representative and the bid contract price shall be full compensation for all costs in connection therewith.

<u>ITEM 994.1</u>	<u>TEMPORARY PROTECTIVE SHIELDING</u>	<u>SQUARE FOOT</u>
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The work under this Item shall provide for the protection of traffic, persons, and facilities on the roadway beneath bridges from falling debris during the removal of the unsound concrete from bridge decks, parapets, copings and sidewalks. This shall be accomplished by the utilization of adequate shielding methods.

No portion of the bridge deck shall be removed until the protective shielding is in place and complete.

Note that some of the bridges, due to their height (vertical clearance), will require special lifting equipment in order to place shielding for the assigned bridge repair work. Any equipment necessary to erect forms will be considered incidental to these items.

Any existing formwork on the bridge shall also be removed and disposed by the Contractor away from the job area, at no additional expense.

All shielding shall meet the following requirements:

1. Temporary Protective Shielding must be used on bridges over roadways, railroads, and waterways during full depth excavation and when, in the opinion of the Engineer, there is the possibility of dislodging concrete from the bottom of the deck, parapets or coping. In some cases, the Contractor may be able to utilize the bottom flanges of existing steel beams as supports for the protective shielding. However, the Contractor will not be permitted to weld onto, drill into, or cut any existing structural steel beams.
2. The Contractor shall submit drawings and calculations stamped by a Professional Engineer of the appropriate discipline registered in Massachusetts of the proposed temporary shielding to the Engineer for approval prior to its installation. The drawings shall include details of all connections, brackets, and fasteners. However, when the spacing between existing steel beams is 70 inches or less, the Contractor may utilize a wood plank shielding scheme.
3. Shielding shall be designed to safely withstand all loads that it will be subjected to. The allowable design stresses shall be in accordance with AASHTO Standard Specifications for Highway Bridges, 17th Edition. The design shall also include a description of the equipment and construction methods proposed for the deck, parapet, or coping excavation and the maximum size of the area being excavated. The shielding shall also be designed to withstand the maximum size of the excavated area should it fall during excavation or removal. No debris shall be swung over traffic, on or below the bridge.
4. Shielding shall be designed such that impact on traffic during installation and removal shall be minimal. The Contractor shall submit the traffic plan to the Engineer for approval.
5. The shielding shall extend a sufficient distance above and beyond the deck overhang at the fascia where concrete excavation is required outside the fascia beams. The shielding shall extend the length of the damaged or distressed portion of the deck a length of sufficient distance to do the required deck demolition. Also, the width of shielding shall completely extend over the travel lanes and shoulders of the highway below and shall extend a minimum of one beam width in the transverse direction beyond the limits of the excavation.

ITEM 994.1 (Continued)

6. The area for shielding shall be approved by the Engineer prior to any installation of any shielding. The Contractor may utilize the bottom flanges of existing beams as supports for the protective shielding. However, the Contractor will not be permitted to weld onto, drill into, or cut any existing structural steel beams. All spaces along the perimeter of the shielding and at the seams shall be sealed to prevent dust, water, and debris from escaping and falling onto traffic below the bridge.

7. The Engineer may request that the shielding be designed so that it may also serve as false work (forms) for all areas of full-depth concrete replacement/repair.

8. The shielding shall not decrease the minimum vertical bridge clearance to the roadway unless otherwise approved by the Engineer.

9. The shielding shall be maintained and remain in place until the strength of the concrete used to repair the deck has cured and reached the design strength requirement, except where shielding needs to be removed and reset to install forming for the areas of full depth repair. The shielding shall remain the property of the Contractor and shall be removed by the Contractor from the site when no longer needed.

If the Contractor's operations damage any existing portions of the bridge that are to remain, such damage shall be repaired at the Contractor's own expense.

All materials used in the temporary shielding system shall become the property of the Contractor and shall be removed from the site upon the completion of the project.

METHOD OF MEASUREMENT

Item 994.1 will be measured for payment by the Square Foot of shielding installed, maintained, and removed upon completion of repair work as required by the Engineer.

BASIS OF PAYMENT

Item 994.1 will be paid at the Contract unit price per Square Foot of shielding installed, maintained, and removed upon completion of repair work as directed by the Engineer.

The Contract price shall include all labor, materials, tools, equipment, and incidental costs required to complete the work as required by the Engineer.

60% of the Unit bid Price will be paid upon installation of the shielding and the remaining 40% will be paid upon removal.

Compensation to provide Engineering Services, when required, will be separately reimbursed as a Non-Bid Item.

END OF DOCUMENT
